

Low risk of COVID-19 among patients exposed to infected healthcare workers

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Abstract: Many patients are fearful of acquiring COVID-19 in hospitals and clinics. We characterized the risk of COVID-19 amongst 226 patients exposed to healthcare workers with confirmed COVID-19; one patient may have been infected, suggesting that the risk of COVID-19 transmission from healthcare workers to patients is generally low.

Key words: COVID; coronavirus; exposure; healthcare worker; transmission

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Introduction:

Many patients are avoiding urgent medical care due to fear of acquiring COVID-19 in hospitals. This has caused increases in deaths due to myocardial infarctions, cerebrovascular accidents, and other acute conditions.^{1,2} In addition, patients are avoiding ambulatory follow up for chronic conditions and cancer screenings. Models predict that delayed screening and avoidance of medical care may lead to more than 10,000 excess deaths in the U.S. from breast and colorectal cancer alone.³

Some of this behavior is driven by fear of acquiring COVID-19 from healthcare workers, as infection has been shown to be common amongst staff in some hospitals and some providers may work while pre-symptomatic or asymptomatic.^{4,5} Quantifying the risk to patients of SARS-CoV-2 infection following an exposure to an infected healthcare worker is therefore essential to inform patients' decision-making and to build confidence in the safety of medical care. Transmission risk in healthcare settings may be different than risk in the community because of differences in the ways in which patients and providers versus members of the public interact, screening protocols, use of standard precautions, masking of patients and providers, use of additional personal protective equipment, quality of ventilation, hand hygiene, and routine cleaning with effective disinfectants.⁶ We therefore characterized the risk of infection among patients exposed to healthcare workers who were subsequently diagnosed with COVID-19 in an academic medical center.

Methods:

From 3/1/2020-6/10/2020 we conducted healthcare-based contact tracing for all patients and healthcare workers who tested positive for COVID-19 at a large academic medical center in Boston. We identified all patients potentially exposed to each COVID-19 case starting from the date of symptom onset and continuing until the last day of exposure; on 4/4/20, we modified our protocol to also include patients exposed in the 48 hours prior to symptom onset as per evolving state guidance. An exposure was defined as ≥ 10 cumulative minutes of face-to-face contact within 6 feet, during which at least one person was not wearing a mask.

All exposed patients were notified of their exposure and assessed for symptoms including cough, shortness of breath, fever, chills, muscle pain, sore throat, and/or new loss of taste or smell. During the first two months of the study period, we referred all symptomatic patients for testing. Starting 5/11/20 we referred all exposed patients for testing regardless of symptom status in accordance with revised state guidance. Exposed patients were asked to self-isolate for 14 days after their exposure and to report any new symptoms. At the end of the 14-day follow-up period, all patients were reassessed via telephone for ambulatory patients and via electronic healthcare record review for inpatients. COVID-19 was considered healthcare-associated if an exposed patient tested positive for SARS-CoV-2 within 14 days of a healthcare exposure. Patients were considered lost to follow up if we were unable to reach them via telephone or if there was no electronic documentation available within 2 days of the end of their incubation period.

Hospital policy initially only required providers to wear personal protective equipment when seeing patients with symptoms concerning for COVID-19; however, universal

masking of providers was announced on 3/22/2020 and required on 3/25/2020 and patient masking was implemented on 4/6/2020. If information on use of the mask for the healthcare provider was not available, we assumed that healthcare workers did not wear a mask before the universal masking policy was announced and did wear a mask after the announcement.

Results:

Between 3/1/2020 and 6/10/2020, 238 patients met our exposure criteria; all exposures were to infected healthcare workers (n=60), none were due to patient-to-patient exposures. Of the 238 exposed patients, 137 (58%) were female and 80 (34%) were age 65 or greater. One quarter of exposures (60/238) occurred in the outpatient or emergency department setting, the rest in the inpatient setting. Fifteen patients were exposed twice hence there were 253 exposures overall (Figure 1). Among the 60 infected healthcare workers, there were 35 registered nurses, 12 physicians, 7 patient care associates, 2 physician assistants and 1 medical assistant, physical therapist, sonographer and interpreter. The median number of exposed patients per our exposure criteria was 3, interquartile range (1.75-5). In 87 exposures, neither the infected provider nor the exposed patient wore a mask, and in 166 exposures, only the infected healthcare worker wore a mask.

Follow-up at 14 days after exposure was available for 226/253 exposures (89%).

Testing was performed after 92/253 exposures. Only 2 patients tested positive for SARS-CoV-2. The first was exposed to a physician for 30 minutes during an outpatient visit on the day the physician's symptoms began; neither the patient nor physician were masked. A second patient tested positive 6 days following exposure to a nurse for more than 10 minutes in the perioperative setting; only the nurse was masked. However, this

patient also had an intimate household contact who tested positive on same day that they were exposed to the infected healthcare worker. Considering that the patient was exposed to their household member before they were exposed to the infected healthcare worker and that the highest risk of transmission occurs among household contacts,⁶ we attributed this exposure to the patient's household contact. Neither patient was tested prior to the exposure. An additional 37 exposed patients developed symptoms; 34/37 were tested and all were negative. Among the 3 patients who were not tested, 2 were evaluated in outside medical centers and did not meet their criteria for testing. Of the additional 187 patients who did not develop symptoms, 54 were nonetheless tested and all had negative results. Five patients died prior to the 14 day follow up period, 2 of whom were tested and found to be negative. The other 3 patients' deaths were attributed to their underlying cancer (2 patients) and progressive heart failure (1 patient); their providers did not note symptoms consistent with COVID-19 prior to their deaths. Finally, 22 patients were lost to follow up before the end of the 14-day incubation period. Of the 226 exposures with complete follow up, we were only able to document 1 confirmed infection with SARS-CoV-2 attributable to the exposure (0.4%).

Discussion

Among 253 patients exposed to infected healthcare workers in the inpatient, emergency, and outpatient settings we were only able to identify one clear case of COVID-19 transmission from a provider to a patient. This event occurred prior to implementation of universal masking for patients and providers hence the current risk to patients may be even lower. This assessment provides reassuring data to patients and their providers, documenting that the risk to patients' of acquiring COVID-19 from an infected healthcare worker is very low.

The low risk of transmission to patients in the healthcare setting is consistent with emerging literature on secondary attack rates for COVID-19. The risk of transmission is closely tied to duration and intimacy of contact,⁶ and likely varies based on viral burden, symptoms, mask use, proximity, duration of contact, quality of ventilation, and thus inoculum. The risk is highest in household members (10-40%), intermediate amongst traveling partners and individuals sharing a meal (5-15%), and low following brief encounters with strangers (<1%).⁶⁻⁹ Likewise, the risk of transmission from infected patients to healthcare workers is also low (<3%),¹⁰⁻¹² but this is the first paper to our knowledge documenting a similarly low risk for patients exposed to infected healthcare workers.

Notably, more than 50% of exposures occurred in instances where the infected healthcare worker was wearing a mask but the patient was not. The low risk of transmission in this context is reassuring. CDC currently recommends furloughing healthcare workers exposed to unmasked patients with COVID-19 if the provider was not wearing both a mask and eye protection. Our data suggest that the risk of transmission is low even in the absence of eye protection so long as the infected person is masked.

The low rate of transmission from infected healthcare workers to patients begs the question of whether patients exposed in the healthcare setting should routinely be notified. Our practice has been to notify all exposed patients or their caregivers, but exposure notifications to patients are not benign. Exposed outpatients are asked to self-isolate, to obtain testing, and if hospitalized during the incubation period are placed on precautions. In some cases, this led to delays in treatment including chemotherapy and surgical procedures. In addition, exposure notifications are a source of anxiety for many and sometimes lead patients and their families to alter their living arrangements

or to choose to forego close family contacts (including in some instances separation of mothers from their newborn infants). These potential sources of harm associated with over-notification highlight a need to develop clear, evidence-based definitions for patient exposures that better predict risk of transmission. Such definitions could enable focus of healthcare resources on the highest risk exposures and avoid the potentially detrimental consequences of overly inclusive definitions.

Limitations of this study include the fact that the exposure definition, mask requirements and testing recommendations evolved over time. All exposed asymptomatic staff and patients were not referred for testing until 5/11/2020, and many exposed asymptomatic patients were never tested, potentially missing some infected patients. We may also have missed some exposures from infected staff members who never developed symptoms; however, we documented in a separate analysis that the incidence of hospital-acquired COVID-19 in our institution during this same period was exceedingly low.¹³ Finally, 11% of exposures involved patients that were lost to follow-up.

In summary, less than 1% of patients exposed to an infected healthcare worker developed COVID-19. This observation provides reassurance that transmission from healthcare workers to patients is rare and that patients should feel safe resuming routine care, particularly in hospitals and clinics with comprehensive infection prevention and control programs.

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Figure 1. Outcomes of patients exposed to healthcare workers with confirmed COVID-19

