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Lack of severe acute respiratory coronavirus virus 2 (SARS-CoV-2) transmission from a healthcare worker to a cohort of immunosuppressed patients during the SARS-CoV-2 omicron variant surge, California, 2022

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To the Editor—During the coronavirus disease 2019 (COVID-19) surge in January 2022 caused by the severe acute respiratory coronavirus virus 2 (SARS-CoV-2) o (omicron) variant, more infections among healthcare workers (HCWs) were documented than at any other point in the COVID-19 pandemic. Transmission from infected HCWs to other HCWs and patients is a noteworthy concern. The risk of an HCW acquiring COVID-19 from another HCW is reportedly 3 times higher than contracting it from patients.¹ Given that not all infections are detected, it is critically important that during surges, all infection controls (administrative, engineering, and personal protective equipment [PPE]) are optimized to protect patients and HCW colleagues.² We report a case in which a highly infectious HCW working with profoundly immunosuppressed patients did not transmit SARS-CoV-2 to patients despite multiple close interactions. Our data analysis was approved under the Stanford University Institutional Review Board (IRB) through expedited review.

The index HCW was vaccinated with BNT162b2 in December 2020 and January 2021 and received a booster vaccination in October 2021. The HCW was in their usual state of health and had a negative routine screening rtPCR anterior nares swab (self-collected; Color Health, Inc) on the Monday of the week of infection; medical school personnel were required to test weekly regardless of symptoms or exposure history. The following day, the HCW felt mild fatigue in the morning, which resolved soon after awakening. The HCW proceeded to work and performed physical exams on 7 patients over the course of the day. The patients were moderately to severely immunocompromised. All but 1 patient had undergone solid-organ transplantation, and 1 patient had undergone heart transplantation on day 1 following the interaction with the infectious HCW. The HCW began to feel symptoms while on the wards, including severe fatigue, diffuse sweating, and chills, which prompted the HCW to leave the wards and proceed with rapid rtPCR testing via a nasopharyngeal sample.

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The HCW went home to isolate. The rtPCR returned positive within 2 hours (cycle threshold value [Ct], 15.9). The HCW had also examined 7 patients the day before symptom onset. Of these patients, 3 were examined both days. The HCW worked closely with another HCW for ~8 hours the day before onset of symptoms and for ~6 hours on the day of symptom onset.

The index HCW reported wearing an N95 respirator during all patient encounters and during all other activities during the work-day. Both HCWs wore fit-tested N95 respirators in the presence of each other. Patients were not masked during encounters, except one who was wearing both an N95 respirator and a surgical mask. Patient encounters were reported as being <2 m distant but <15 minutes in duration. None of the patients were in airborne isolation because they had not reported any recent COVID-19 symptoms or known exposures. Although the index HCW's sample was not subjected to whole-genome sequencing, most samples were SARS-CoV-2 omicron variant during this period. We tested all patients except for 2 who had been discharged. All available SARS-CoV-2 tests returned negative (Table 1). The second HCW who was exposed also tested negative on multiple follow-up tests.

This report is important for several reasons. First, the HCW had a negative weekly screening test on Monday with only mild fatigue that resolved upon awakening on the next day. This type of symptomatology would not be accurately picked up on a screening symptom survey given high frequency of fatigue among HCWs at baseline.³ Second, the patients themselves were not adequately masked, which emphasizes the need for HCWs themselves to wear high-quality masks as PPE and source control, such as N95 respirators. Third, these patients were immunocompromised, putting them at higher risk of severe infection and death (as high as 13%–20%) if they were to contract SARS-CoV-2.^{4,5}

We hypothesize many possible reasons why the index case did not transmit to patients or other HCWs. First, the index case was wearing an N95 respirator, which may have provided superior source control compared to surgical masks.⁶ Both HCWs who were in close contact for 2 days were wearing N95 respirators during all encounters. Some have argued that the universal use of N95 respirators during COVID-19 surges is an important measure to reduce in-hospital transmission.²

Table 1. Patient Characteristics, Timing of Exposure, and Follow-Up Test Results for 9 Transplant Patients Cared for by an Infectious Healthcare Worker Wearing a Fit-Tested Respirator for Source Control, California, January 2022

Patient	Age, Years, and Sex	Diagnosis (Date of Transplant)	Day of Exposure ^a	Day of Follow-Up Test(s)	Type of Test	Test Result(s)
1	56 F	Pre-heart	0	3 and 5	Nasopharyngeal	Negative
2	62 M	Lung (8/2021)	0	3 and 5	Nasopharyngeal and midturbinate	Negative
3	46 F	Liver (4/2021)	-1 and 0	5	Nasopharyngeal	Negative
4	62 F	Liver (2/2021)	-1	5 and 5	Nasopharyngeal and midturbinate	Negative
5	60 F	Kidney (4/2019)	-1 and 0	5	Midturbinate	Negative
6	65 M	Heart/Liver (12/2020)	-1	3 and 5	Nasopharyngeal	Negative
7	70 M	Lung (11/2021)	-1	5	Midturbinate	Negative
8	55 M	Heart (10/2021)	-1 and 0	5	Nasopharyngeal	Negative
9	56 F	Redo lung (8/2019 and 12/2021)	-1	4 and 5	Nasopharyngeal and nasal	Negative

^aDay 0 was the day of index-case symptom onset.

Second, the duration of interactions with each patient was <15 minutes, and transmission has a time-dependent relationship; thus, shorter patient encounters likely reduced transmission risk. Many hospitals employed virtual rounding and telemedicine technologies for patient care to minimize the number of HCW entering patient rooms during surges.⁸ Third, at baseline, non-airborne isolation patient rooms have enhanced ventilation at ~4 air changes per hour, which would be partially protective against transmission. Fourth, the index case did not have respiratory symptoms, such as cough, which otherwise could have altered the fit of the N95 respirator and caused release of infectious aerosols during close patient contact. Fifth, the index case was vaccinated and received a booster, which could have resulted in a lower viral load before and during symptom onset than might be observed in unvaccinated HCWs.⁹ Sixth, not all index cases transmit efficiently, as evidenced by the dispersion factor of SARS-CoV-2.¹⁰ Some transmission events may not have been detected because patients did not receive serial testing past the first week. Longer incubation periods have been reported in some hosts. In summary, the additive effects of infection controls (administrative, engineering, and PPE) prevented transmission from a highly infectious HCW to a cohort of profoundly immunosuppressed patients during the COVID-19 wave due to the SARS-CoV-2 omicron variant.

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