Exposure Outcomes in Fully Vaccinated Healthcare Personnel With Known Severe Acute Respiratory Syndrome Coronavirus 2 Exposure—Minnesota, January–August 2021

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Healthcare personnel (HCP) are at potential risk for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection in occupational and nonoccupational settings, even when fully vaccinated. This risk increased during Delta variant circulation. SARS-CoV-2 testing of fully vaccinated HCP working in the 14 days after exposure is important to prevent virus introduction into healthcare settings.

Keywords. SARS-CoV-2; COVID-19; healthcare personnel; occupational health.

Since the first confirmed coronavirus disease 2019 (COVID-19) case reported in Minnesota in early 2020, the Minnesota Department of Health (MDH) has required healthcare facilities to report healthcare personnel (HCP) exposures to people with confirmed COVID-19 for an exposure risk assessment, communication about recommended quarantine based on the HCP exposure and vaccination status, and enrollment of HCP with higher-risk exposures into a 14-day symptom monitoring program using electronic surveys. The MDH process of risk assessment and monitoring of HCP after higher-risk exposure (defined below) has been previously described [1]. In short, HCP exposures are reported to MDH by acute care, skilled nursing, and assisted living facilities, as well as by group homes and home care organizations. MDH staff obtained informed consent and interviewed exposed HCP with a standardized questionnaire to identify those who experienced higher-risk exposures. In this brief report, we summarize the higher-risk exposures experienced by fully vaccinated and unvaccinated HCP since severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) vaccination became available in late December 2020.

METHODS

For the periods before (19 January–19 June 2021) and during (20 June–16 August 2021) widespread Delta variant circulation, we compare the proportions of fully vaccinated and unvaccinated HCP testing positive after higher-risk exposure and describe the types of exposures associated with a positive test. Testing might have occurred as part of occupational health programs in healthcare facilities, at community testing sites, in clinical settings (eg, clinic, pharmacy), or elsewhere. Minnesota has mandated laboratory reporting of positive SARS-CoV-2 tests.

Prolonged close contact has been defined by the Centers for Disease Control and Prevention (CDC) as being within 6 feet for a cumulative total of 15 minutes over 24 hours [2]. In this analysis, higher-risk exposure was defined as prolonged close contact to a person in a social setting or to someone living in the same household with COVID-19, or an occupational interaction (eg, with an infectious patient or coworker) where the HCP did not use all appropriate personal protective equipment (PPE) or had a breach of PPE as outlined in the CDC risk assessment [2]. Exposed HCP were cross-matched to reported cases in the MDH COVID-19 case database to identify HCP who tested positive within 14 days of exposure. HCP who had a positive SARS-CoV-2 test in the 90 days prior to exposure were excluded, as CDC does not recommend additional testing for individuals in the 90 days after testing positive, unless they become symptomatic [3]. Vaccination status was verified in the Minnesota Immunization Information Connection, the state’s vaccination registry. HCP are considered fully vaccinated ≥14 days after the final dose in a SARS-CoV-2 vaccine series. The period defined as “Delta transmission” began on June 20, the beginning of the week when >50% of Minnesota’s SARS-CoV-2–positive specimens undergoing whole genome sequencing were identified as containing the Delta variant. Differences between proportions were assessed using the $\chi^2$ test, with statistical significance indicated by $P$ value $<.05$.

During 19 January–16 August 2021, MDH interviewed HCP from 646 hospitals and clinics and 572 congregate-care facilities who had experienced potential higher-risk exposure. We investigated 2597 HCP who experienced a single higher-risk exposure during the study period. Median age was 38 years (range, 15–78 years), 82.4% were female, and 82.6% reported
White race. HCP (n = 76) who experienced multiple higher-risk exposures during the study period were excluded from analysis but did receive communication from MDH and were enrolled in symptom monitoring after each exposure, as previously described [1].

This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy (see, eg, 45 Code of Federal Regulations [C.F.R.] part 46; 21 C.F.R. part 56; 42 United States Code [U.S.C.] §241(d); 5 U.S.C. §552a; 44 U.S.C. §3501 et seq).

RESULTS

Of the 2597 HCP with higher-risk exposure, 1027 (40%) were fully vaccinated at the time of exposure. Of those with higher-risk exposures, vaccinated HCP were more likely to report White race than unvaccinated HCP (87% and 81%, respectively, \( P < .001 \)). Exposure and test-positivity data are shown as are \( P \) values for \( \chi^2 \) comparisons between fully vaccinated and unvaccinated HCP (Table 1). In the pre-Delta period, 5% of all fully vaccinated HCP and 20% of all unvaccinated HCP tested positive for SARS-CoV-2 in the 14 days following exposure. No fully vaccinated HCP tested positive after occupational exposure, but 6.2% of fully vaccinated HCP tested positive after household or social exposure. Among unvaccinated HCP, 22% tested positive after household or social exposure compared to 15% following occupational exposure.

In the Delta transmission period, 12% of all fully vaccinated HCP and 24% of all unvaccinated HCP tested positive within 14 days after exposure (\( P = .01 \)). Of the fully vaccinated HCP who tested positive during this period, 71% had experienced a household or social exposure and 29% tested positive after occupational exposure. In the Delta transmission period, there was no statistical difference in the proportions of fully vaccinated HCP and unvaccinated HCP who tested positive following a household or social exposure (27% and 32%, respectively) or after occupational exposure (5.3% and 13%), although the number of exposed HCP was small. The mean time from vaccination to exposure for HCP who tested positive and HCP who did not varied by period (pre-Delta, 66.4 days and 58.2 days, respectively; during Delta, 155.3 days and 155.0 days, respectively).

The difference in outcomes for HCP between the pre-Delta and Delta transmission periods is noteworthy. A greater proportion of fully vaccinated HCP tested positive after any higher-risk exposure during the Delta transmission period than during the pre-Delta period (12% and 4.8%, respectively). While zero fully vaccinated HCP with reported occupational higher-risk exposure tested positive for SARS-CoV-2 in the pre-Delta period, 5.3% of fully vaccinated HCP tested positive following occupational exposures during Delta transmission. The overall percentage of fully vaccinated and unvaccinated HCP who tested positive remained significantly different in the Delta transmission period (12% and 24%, respectively).

DISCUSSION

While the risk-based exposure data presented here provide important insight into HCP infection with SARS-CoV-2, there are several limitations. The number of HCP exposed in the Delta

| Study Period | Fully Vaccinated | Unvaccinated | Total |
|--------------|-----------------|--------------|-------|
|              | HCP Positive/Exposed | % HCP Positive of Exposed | HCP Positive/Exposed | % HCP Positive of Exposed | % HCP Positive of Exposed |
| Pre-Delta (19 Jan–19 Jun 2021) | | | | |
| All exposures | 43/998 | 4.8 | 293/1449 | 20.2 | <.001 | 336/2337 | 14.4 |
| Household/social | 43/692 | 6.2 | 245/1310 | 18.7 | <.001 | 288/1822 | 15.8 |
| Occupational | 0/196 | 0 | 48/319 | 15.1 | <.001 | 48/515 | 9.3 |
| Delta transmission (20 Jun–16 Aug 2021) | | | | |
| All exposures | 17/139 | 12.2 | 29/121 | 24.0 | .01 | 46/260 | 17.7 |
| Household/social | 12/44 | 27.3 | 22/69 | 31.8 | .60 | 34/113 | 30.1 |
| Occupational | 5/95 | 5.3 | 7/52 | 13.5 | .08 | 12/147 | 8.2 |
| Overall (19 Jan–16 Aug 2020) | | | | |
| All exposures | 60/1027 | 5.8 | 322/1570 | 20.5 | <.001 | 382/2597 | 14.7 |
| Household/social | 55/736 | 7.5 | 267/1199 | 22.3 | <.001 | 322/1935 | 16.6 |
| Occupational | 5/291 | 1.7 | 55/371 | 14.8 | <.001 | 60/662 | 9.1 |

Abbreviation: HCP, healthcare personnel.

*Testing might have occurred as part of occupational health programs in healthcare facilities, at community testing sites, in clinical settings (eg, clinic, pharmacy), or elsewhere. Minnesota has mandated laboratory reporting of positive severe acute respiratory syndrome coronavirus 2 tests.
transmission period was considerably smaller than the pre-Delta period because of a shorter time frame, and the proportion of those included in postexposure surveillance was smaller because of an overall decline in the rate of case interviews and contact tracing conducted later in the pandemic. Possible effects of waning immunity and time since completion of vaccine series were not addressed in this analysis. Because most HCP in Minnesota were vaccinated in December 2020 or early 2021, immunity of fully vaccinated HCP, as a group, might have differed in the pre-Delta and Delta periods. This analysis did not account for whether HCP had previous SARS-CoV-2 infection. Previous infection might have influenced outcomes of both unvaccinated and fully vaccinated HCP, potentially biasing the outcome toward the null.

As has been described elsewhere, we found that HCP are at potential risk for SARS-CoV-2 infection, even when fully vaccinated, and that this became more common after emergence of the Delta variant [4]. Our data regarding documented exposure types enrich the understanding of HCP risk in and outside of the workplace. Regardless of vaccination status, CDC and MDH recommend that HCP who have had a higher-risk exposure, but remain asymptomatic, be tested for SARS-CoV-2 immediately (but not earlier than 2 days after exposure) and again 5–7 days after exposure [2]. Although vaccinated individuals with Delta variant infection may have a shorter infectious period than those who are unvaccinated, fully vaccinated individuals can pose potential risk of SARS-CoV-2 transmission to others [6,7]. Consistent with previous data published by MDH and others, more HCP tested positive, regardless of vaccination status, after exposures that occurred outside the workplace, in household or social settings [1,8]. At the time of this study, CDC did not recommend quarantine after higher-risk exposure for HCP who were 14 days past completion of a full vaccine series [2]. Because of the increased transmissibility of the Omicron SARS-CoV-2 variant, CDC recommendations now include quarantine for eligible HCP who have not received a booster, which can be shortened by acquisition of a negative test. Although the emergence of new SARS-CoV-2 variants may impact vaccine effectiveness, testing and adequate PPE use remain important tools to limit transmission in healthcare settings. The data shown here indicate that SARS-CoV-2 testing after higher-risk exposure might reduce risk of virus entry into healthcare settings. Healthcare organizations might consider development of protocols that incorporate repeated testing of fully vaccinated HCP who continue to work during ongoing household exposure. Providers should establish protocols for booster vaccination of HCP who finished their primary SARS-CoV-2 vaccine series ≥6 months earlier, as recommended by CDC [9].

Notes

Disclaimer. The findings and conclusions of this report are those of the author(s) and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Potential conflicts of interest. The authors: No reported conflicts of interest. All authors have submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest.

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