

Testing for SARS-CoV-2 in Symptomatic Vaccinated and Unvaccinated Health Care Workers During the Delta Variant Surge

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Background: Infection with SARS-CoV-2 in health care workers (HCWs) challenges employee health services. **Methods:** We analyzed telephone Coronavirus Disease 2019 (COVID-19) hotline data over 8 weeks in 2021 during SARS-CoV-2 Delta variant surge. We calculated COVID-19 case rates among persons-under-investigation (PUIs) for illness at two health care centers (HCs). **Results:** There were 41 COVID-19 cases among the 285 PUIs (14.4%) at the study HC and 549 (16.9%) of 3244 at the comparison HC. At the study HC, 11.7% of vaccinated PUIs versus 36.6% of unvaccinated PUIs were COVID-19 positive. The COVID-19 positivity rates among vaccinated and unvaccinated PUIs at the comparison HC were 16.1% and 33.3%, respectively. **Discussion:** In the SARS-CoV-2 Delta variant surge, COVID-19 test positivity rates among unvaccinated symptomatic HCWs are dramatically elevated. Aggressive testing of HCW PUIs is particularly critical during periods of disease upsurge.

Keywords: COVID-19 testing, employee health, persons under investigation

BACKGROUND

Health care workers (HCWs) have been at the epicenter of the Coronavirus Disease 2019 (COVID-19) epidemic. With the relatively high uptake of COVID-19 vaccination among HCWs, even before recent mandates, and with the superimposed threat of the more infectious Delta variant of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) virus, capturing trends in infection among HCWs by vaccination status is timely in occupational health care planning and delivery.

We previously reported that the patterns of COVID-19 case positivity among HCWs referred for testing because of symptoms, “Persons Under Investigation” (PUIs), were similar at two affiliated but differing Health Care Centers (HCs) and also generally mirrored

community local trends.¹ That previous report covered 10 consecutive 4-week blocks of time in 2020, from the early upsurge in COVID-19 case incidence in the study region. To assess the impact HCW vaccination and also of the COVID-19 surge associated with the SARS-CoV-2 Delta variant, we reexamined the incidence of HCW PUI cases and the rates of COVID-19 test positivity among them over an 8-week period in July 2021. This time period corresponded with a new surge associated with the SARS-CoV-2 Delta variant during which regional cases increased more than 10-fold, rising sharply in July and continuing to rise throughout August before peaking in September.²

METHODS

The primary data source (the study health care center [HC1]) drew on Employee Health Service COVID-19 case reporting at the San Francisco Veterans Affairs Health Care System (SFVAHCS), with a main hospital site located in San Francisco along with outpatient clinics geographically distributed, predominantly located in California coastal counties north of San Francisco. For the purposes of quality improvement project, we extracted from the database of our Employee Health COVID-19 hotline database. Employees are encouraged to call the hotline for any symptoms potentially related to COVID-19, including respiratory, gastrointestinal, neurological, loss of taste or smell, and fever or malaise. Symptomatic callers are then referred for polymerase chain reaction (PCR) testing. We studied cases tested over an 8-week period from July 1 through August 25, 2021. We extracted the date of test and the result reported (positive or negative). A small proportion of persons tested outside of the SFVAHCS (eg, through a primary care provider). Either external or internal results using polymerase chain reaction (PCR) from any testing platform were considered valid.

For comparative purposes, we obtained the number of PUIs and the rate of positive results among them for the same 8-week period from the Occupational Health Service (OHS) of the University of California, San Francisco (UCSF). The SFVACS HC1 is academically affiliated with UCSF, HC2 for this analysis. The OHS of HC2 has its own hotline system and tracks the result of its onsite testing for symptomatic PUIs. The working population of the HC2 is approximately five-fold larger than HC1. The bulk of COVID-19 vaccinations among HC1 personnel were with the Moderna vaccine with the remainder Johnson & Johnson or Pfizer; vaccinations of HC2 personnel were most commonly with the Pfizer vaccine, with the remainder with the other two products.

RESULTS

The frequencies all PUIs and COVID-19 positive PUIs at HC1 are HC2 over 8 weeks in July and August 2021 are shown in Fig. 1. At HC1, there were 285 PUIs, of whom 255 (89.5%) were COVID-19 vaccinated (Panel A). Of 3244 PUIs at HC2, 95.4% were COVID-19 vaccinated (Panel B). There were 41 among 285 (14.4%) PUIs at HC1 who were COVID-19 test positive and 549 among 3244 (16.9%) PUIs at HC2 who were COVID-19 positive.

Figure 2 presents the percent positivity broken down by vaccination status for both sites. At HC1, 11.7% of vaccinated

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Clinical Significance: In the SARS-CoV-2 Delta variant surge, COVID-19 test positivity rates among symptomatic, vaccinated health care workers (HCWs) are somewhat increased, but among symptomatic unvaccinated HCWs care workers, dramatically elevated. Aggressive COVID-19 testing of HCWs with symptoms is particularly critical during periods of disease upsurge.

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Ethical Considerations & Disclosures: This report is based on quality improvement efforts. Running Head Title: SARS-CoV-2 unvaccinated health care workers.

Conflicts of Interest: None declared.

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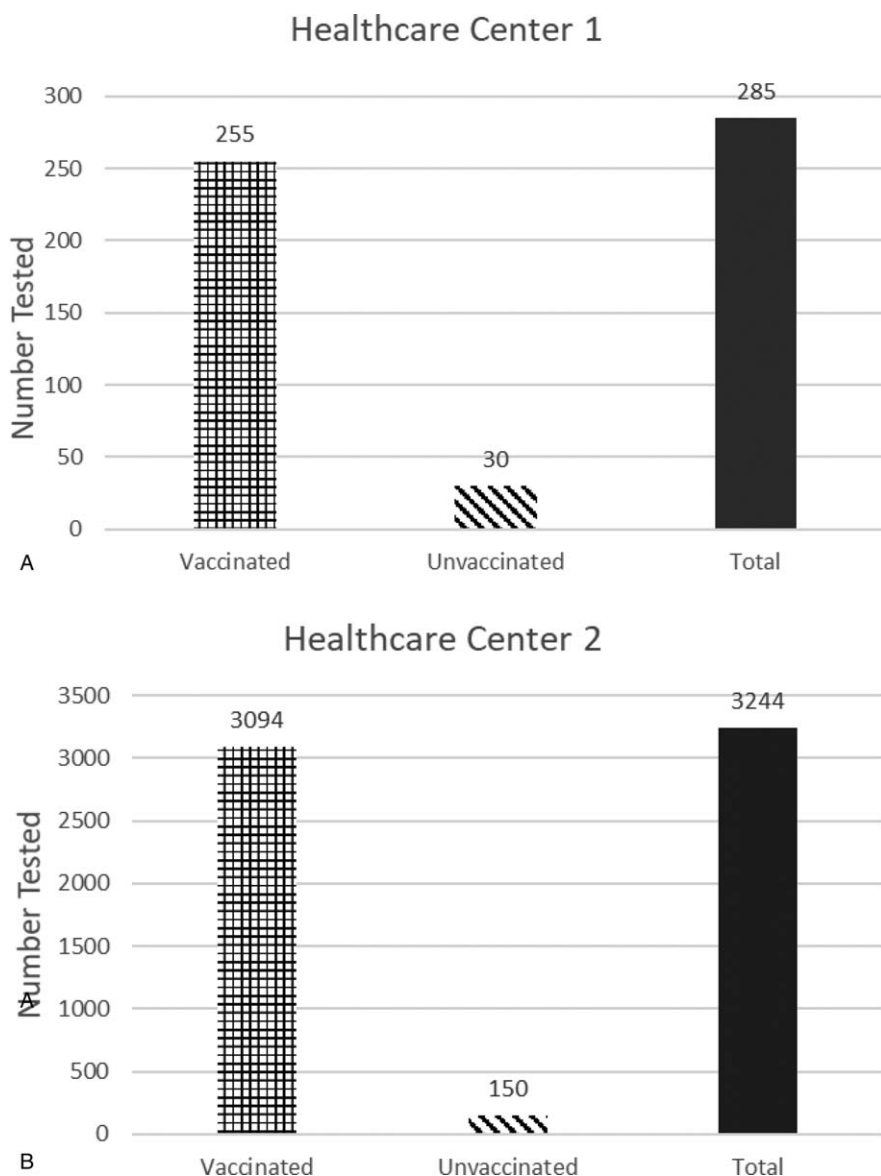


FIGURE 1. Persons under investigation (PUIs), by vaccination status, tested for COVID-19 at two health care centers over 8 weeks from July 1 to August 25, 2021. Panel A: Health Care Center 1. Panel B: Health Care Center 2.

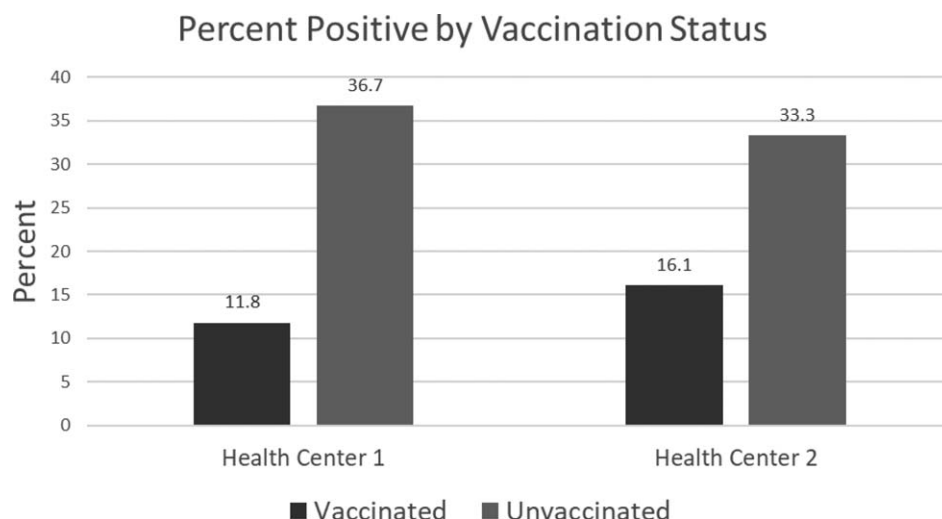
PUIs were found to be COVID-19 positive, compared with a 36.6% positivity rate among the unvaccinated. At HC2, 16.1% of the vaccinated PUIs were COVID-19 positive, compared with 33.3% of the unvaccinated. The proportion of COVID-19 positive PUIs but did not differ statistically by HC for either the vaccinated ($P=0.08$) or the unvaccinated ($P>0.8$).

DISCUSSION

Our data from two health care centers in the same geographic area, despite differing size and other characteristics, demonstrate remarkably similar patterns of HCWs COVID-19 test positivity among PUIs. This observation is consistent with our previous report of similar PUI positivity rates for these two hospitals over an extended period of observation early during the initial COVID-19 pandemic, spanning two local waves of the COVID-19 pandemic. What is strikingly different compared with our previous experience, which was prior to protective vaccination but also prior to the SARS-CoV-2 Delta variant-driven wave of infection, is both the case incidence in absolute terms and the case positivity rate among PUIs. The 285 PUIs

reported over 8 weeks in July and August at the study site (HC1) is markedly higher than any 8-weeks over the period we reported previously, when the highest incidence was 234 PUIs, observed during the two-highest intervals combined (July 7 to August 3 and November 24 to December 21, 2020), in the midst of the initial and second waves of COVID in our region.¹ Over the latter period in December, 2020, which was just at the time of initial vaccinations among the first HCWs, the PUI positivity rate was at HC1 was 12.3%. In contrast, the July to August 2021 positivity rate among the vaccinated was 11.8%, while the 36.6% COVID-19 positivity rate among unvaccinated PUIs marks a more than three-fold higher rate than among the universally unvaccinated in 2021. The remarkably similar positivity rate of 33.3% amongst the unvaccinated at HC2 supports the validity of the observation. Available test positivity for the general population includes both symptomatic and asymptomatic testers with far lower test positivity rates in absolute terms. Nonetheless such data underscore relative increases during this period: statewide in California rising more than threefold over July and remaining more than twice the baseline rate in late August, 2021.³

FIGURE 2. Test positivity rates among Persons under investigation (PUIs) at each of two health care centers by COVID-19 vaccination status. At Health Center (HC) 1, 11 of 30 unvaccinated PUIs tested positive for SARS-CoV-2, compared with 30 of 255 vaccinated PUIs. At HC2, 50 of 150 unvaccinated PUIs tested positive for SARS-CoV-2, compared with 499 of 3094 vaccinated PUIs.



Since the COVID-19 pandemic first reached the United States in 2020, assessing the rate of positivity among PUIs has been central to gauging and controlling infection. As early as February 2020, for example, a Centers for Disease Control team reported that among the 210 PUIs tested, 11 (5%) were found to be COVID-19 positive.⁴ For HCWs, surveillance of PUIs can be particularly informative, especially in the midst of surging infections. For example, a series of 701 HCW PUIs from a single hospital in Paris tested over approximately 8 weeks in the Spring of 2020, found that 247 (35.2%) tested positive for COVID-19.⁵ Another report from somewhat later in the pre-vaccination period (March to July 2020) from the UK found that of 3338 HCW PUIs tested, 14.4% were COVID-19 positive.⁶ A study of HCWs that spanned the vaccination uptake period in the first part of 2021 and preceded the SARS-CoV-2 Delta variant surge reported that among positive PUIs, 812 were unvaccinated and 159 were fully vaccinated.⁷ That mix differs substantially from the experience we report among HCW PUIs later in vaccination uptake, in which most of the positive cases in absolute terms were among the vaccinated, even if risk of infection was greater among the unvaccinated.

The limitations of our observational data are relevant. Both HC1 and HC2 are in the same geographic area. Thus, these data may not be transportable to other settings, geographically distant, or with different employee populations. In particular, lower or higher rates of vaccination would be likely to impact overall PUI positivity rates, although this should not explain differences by vaccination status within these working groups nor the similarities of the association between the two health care centers, even with a different mix of vaccine products. Nonetheless, it would be important to evaluate at other sites the differences in COVID-19 test positivity among HCW PUIs with and without the benefit of vaccination, during the current SARS-CoV-2 Delta variant surge and, hopefully, once it has abated. We did not analyze surveillance testing among asymptomatic persons for positivity rates among vaccinated and unvaccinated HCWs. We also did not compare the number or severity of symptoms by vaccination status at either HC1 or HC2, since these were not collected systematically, and cannot assess whether HCWs differed systematically in the degree or type of symptoms that prompted outreach to their hotlines or as predictors of COVID-

19. For example, those who were vaccinated may also have been more vigilant leading to more frequent self-referral for symptoms that proved not to represent COVID-19; conversely, the unvaccinated may have been more likely to deny the significance of symptoms they might have been having until more pronounced or more concerning (such as loss of taste). Further, we did not analyze testing rates per total working populations at either HC1 or HC2 because of a lack of reliable denominator data, in particular by vaccination status.

In summary, we observed greater numbers of PUIs and higher rates of COVID-19 test positivity among HCWs at our study health care center during the SARS-CoV-2 Delta variant surge we had experienced earlier in the COVID-19 pandemic. Moreover, the rates of COVID-19 test positivity among unvaccinated HCWs were dramatically elevated, with a similar phenomenon among HCWs at a comparison health care center. Aggressive testing of HCWs with symptoms that could be consistent with COVID-19 is central to employee health services, all the more so in periods of disease upsurge.

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