Concise Communication

Practices and activities among healthcare personnel with severe acute respiratory coronavirus virus 2 (SARS-CoV-2) infection working in different healthcare settings—ten Emerging Infections Program sites, April–November 2020

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Abstract

Healthcare personnel with severe acute respiratory coronavirus virus 2 (SARS-CoV-2) infection were interviewed to describe activities and practices in and outside the workplace. Among 2,625 healthcare personnel, workplace-related factors that may increase infection risk were more common among nursing-home personnel than hospital personnel, whereas selected factors outside the workplace were more common among hospital personnel.

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Healthcare personnel (HCP) are at risk for severe acute respiratory coronavirus virus 2 (SARS-CoV-2) infection because of close contact with persons with coronavirus disease 2019 (COVID-19) in and outside the workplace. Given the diversity of the HCP workforce and the settings in which they live and work, the risk for acquisition of SARS-CoV-2 infection may vary. We analyzed data from HCP with SARS-CoV-2 infection included in surveillance conducted by the Centers for Disease Control and Prevention (CDC) Emerging Infections Program (EIP). We compared characteristics of HCP cases working in hospitals (H-HCP), nursing homes (NH-HCP) or other healthcare facilities to identify differences in factors potentially affecting SARS-CoV-2 infection risk.

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Mexico, New York, Oregon, Tennessee. Among them, 7 sites conducted sentinel surveillance in selected hospitals or nursing homes: 5 sites in hospitals only and 2 sites in hospitals and nursing homes. Two sites conducted population-based surveillance among HCP who resided in selected counties, and the remaining site conducted sentinel surveillance in selected hospitals and population-based surveillance among NH-HCP in a single county (Table 1).

Healthcare personnel cases were defined as persons serving in healthcare settings with the potential for direct or indirect exposures to patients or infectious materials and with a positive SARS-CoV-2 test on or after April 1, 2020. Health departments or facilities provided lists of HCP tested for SARS-CoV-2 from which cases were identified. EIP staff administered a questionnaire to English- or Spanish-speaking HCP who agreed to participate, usually by telephone using paper or electronic forms, to collect demographics and selected occupational and non–work-related activities and practices in the 14 days before COVID-19 symptom onset or, for asymptomatic HCP, the date of specimen collection for the positive test.

Data collection included information about whether HCP had close contact with persons with COVID-19. We made updates to the definition of close contact as necessary to align with current CDC guidance, which evolved over time. The timing of implementing these updates varied among EIP sites and depended on factors such as institutional review board approval. The process used by EIP site interviewers to communicate the definition of close contact to HCP also varied; some provided the definition to the HCP before asking questions pertaining to close contact, and others provided the definition only if the HCP requested clarification.

Data were entered into a CDC-developed REDCap database. We analyzed data available by November 16, 2020, grouping HCP based on their primary facility (ie, hospital, nursing home, or other facility type, such as outpatient clinics or home health). Characteristics of H-HCP and NH-HCP were compared using mid-P exact tests with statistical significance defined as \( P \leq .05 \). Analyses were conducted using SAS version 9.4 software (SAS Institute, Cary, NC) and OpenEpi. This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy (45 C.F.R. part 46.102(l)(2), 21 C.F.R. part 56; 42 U.S.C. §241(d); 5 U.S.C. §552a; 44 U.S.C. §3501 et seq). EIP sites and participating facilities either deemed the project to be a nonresearch activity or obtained institutional review board approval.

Results

Healthcare personnel participation

As of November 13, 2020, a total of 8,175 cases had been reported to EIP sites: 2,773 were interviewed and 5,402 declined to participate, were not eligible (eg, did not meet the HCP definition), could not be reached, had not yet been contacted for interview, or spoke a language other than English or Spanish. Data for 2,637 of the interviewed HCP were available and were exported on November 16, 2020. However, 12 HCP were excluded: 8 with positive serology tests only, 3 with missing viral test collection dates, and 1 with a viral test collection date before April 2020. Among 2,625 cases in the analysis, the median time from positive SARS-CoV-2 viral test collection date to interview was 19 days (interquartile range [IQR], 9–35 days).

Of the 2,625 cases, 1,225 H-HCP (46.7%) were from 127 hospitals, 604 NH-HCP (23.0%) were from 145 nursing homes, and 789 HCP (30.1%) were from 249 other facilities (Table 1). Also, 7 HCP (0.3%) did not report their facility type. Most cases (70%) were reported from California, Georgia, or New York.

Demographic characteristics, comorbidities, and healthcare roles

NH-HCP were more likely than H-HCP to report their race and ethnicity as either non-Hispanic Black or Asian, or Hispanic or Latino (66.4% vs 46.4%; \( P < .001 \)) and to report having underlying conditions (72.4% vs 66.7%; \( P = .014 \)) (Table 1). A larger percentage of NH-HCP than H-HCP reported working as a nursing assistant or patient care technician (38.9% vs 9.2%; \( P < .001 \)).

Close contact and practices in the workplace

NH-HCP were more likely than H-HCP to report close contact in the workplace with patients (50.5% vs 44.2%; \( P = .008 \)) or coworkers or visitors (31.0% vs 14.8%; \( P < .001 \)) with COVID-19 (Table 2). During care of patients with COVID-19, H-HCP were more likely than NH-HCP to report always using masks or respirators (94.3% vs 90.5%; \( P = .043 \)), gowns (71.5% vs 61.3%; \( P = .002 \)), or eye protection (70.4% vs 62.6%; \( P = .019 \)) (Table 2). H-HCP were also more likely than NH-HCP to report having close contact with patients with COVID-19 who always had source control in place (21.4% vs 5.6%; \( P < .001 \)).

Close contact and activities outside the workplace

Close contact with persons with COVID-19 and selected activities outside the workplace were more common among H-HCP than NH-HCP. A higher percentage of H-HCP than NH-HCP reported close contact with family members with COVID-19 (19.7% vs 6.8%; \( P < .001 \)); attending mass gatherings or gatherings including people other than household members (20.0% vs 5.6%; \( P < .001 \)); and traveling domestically or internationally (18.2% vs 4.3%; \( P < .001 \)).

Discussion

In this diverse cohort of HCP with SARS-CoV-2 infection, we observed that distribution of race and ethnicity and selected practices in and outside the workplace varied by healthcare setting. Approximately two-thirds of NH-HCP reported being part of racial and ethnic minority groups or having underlying conditions, which in some cases may be associated with an increased risk for infection or severe COVID-19. Culturally specific interventions and mitigation support among this HCP population should be considered.

Our data confirm the workplace is an important source of SARS-CoV-2 infection among all HCP, and they suggest that it may be particularly important for NH-HCP, who were more likely to report close contact with patients or others with COVID-19 in the workplace and less likely to report always using recommended personal protective equipment (PPE). This finding is not surprising given the widely recognized challenges with testing, availability of infection prevention expertise and staffing, limited PPE supply, respiratory protection programs, and quarantine and isolation of residents in US nursing homes. To mitigate the effects of COVID-19 on NH-HCP and residents, the CDC and other partners have developed guidance and deployed resources and expertise to nursing homes around the country to bolster infection prevention and control.

In contrast, exposures outside the workplace may be more common for H-HCP, who were more likely than NH-HCP to report close contact with family members or others with...
Table 1. Characteristics of Healthcare Personnel (HCP) With SARS-CoV-2 Infection by Primary Work Setting, April–November 2020

| Characteristic | Hospital (N = 1,225) | Nursing Home (N = 604) | Other Facilitya (N = 789) | All Facilities (N = 2,625)b |
|---------------|-----------------|----------------|----------------|----------------|
| Age, median y (IQR) | 38 (29–49) | 42 (31–53) | 40 (29–51) | 39 (29–51) |
| Sex, no. (%) | | | | |
| Female | 931 (76.0) | 505 (83.6) | 650 (82.4) | 2,090 (79.6) |
| Male | 286 (23.3) | 95 (15.7) | 136 (17.2) | 517 (19.7) |
| Other or not reported | 8 (0.7) | 4 (0.7) | 3 (0.4) | 18 (0.7) |
| Site, no. (%)d | | | | |
| California | 221 (18.0) | 244 (40.4) | 407 (51.6) | 873 (33.3) |
| Colorado | 122 (10.0) | 16 (2.6) | 53 (6.7) | 191 (7.3) |
| Connecticut | 63 (5.1) | 1 (0.2) | 5 (0.6) | 69 (2.6) |
| Georgia | 251 (20.5) | 87 (14.4) | 225 (29.8) | 578 (22.0) |
| Maryland | 84 (6.9) | 0 | 8 (1.0) | 92 (3.5) |
| Minnesota | 76 (6.2) | 9 (1.5) | 17 (2.2) | 103 (3.9) |
| New Mexico | 71 (5.8) | 0 | 24 (3.0) | 95 (3.6) |
| New York | 156 (12.7) | 214 (35.4) | 22 (2.8) | 392 (14.9) |
| Oregon | 153 (12.5) | 0 | 10 (1.3) | 163 (6.2) |
| Tennessee | 28 (2.3) | 33 (5.5) | 8 (1.0) | 69 (2.6) |
| Race and ethnicity, no. (%) | | | | |
| White, non-Hispanic | 575 (46.9) | 169 (28.0) | 202 (25.6) | 949 (36.2) |
| Hispanic or Latino, any race or races | 227 (18.5) | 128 (21.2) | 314 (39.8) | 670 (25.5) |
| Black, non-Hispanic | 235 (19.2) | 177 (29.3) | 145 (18.4) | 557 (21.2) |
| Asian, non-Hispanic | 106 (8.7) | 96 (15.9) | 75 (9.5) | 277 (10.6) |
| Other or multiple races, non-Hispanic | 18 (1.5) | 13 (2.2) | 15 (1.9) | 46 (1.8) |
| Native Hawaiian/Pacific Islander, non-Hispanic | 15 (1.2) | 6 (1.0) | 12 (1.5) | 33 (1.3) |
| American Indian/Alaska Native, non-Hispanic | 12 (1.0) | 0 | 1 (0.1) | 13 (0.5) |
| Race or ethnicity not reported | 37 (3.0) | 15 (2.5) | 25 (3.2) | 80 (3.0) |
| Healthcare role, no. (%)e | | | | |
| Registered nurse | 426 (34.8) | 53 (8.8) | 71 (9.0) | 550 (21.0) |
| Nursing assistant or patient care technician | 113 (9.2) | 235 (38.9) | 38 (4.8) | 386 (14.7) |
| Administrative personnel | 130 (10.6) | 47 (7.8) | 137 (17.4) | 314 (12.0) |
| Home health aide or caregiver | 2 (0.2) | 30 (5.0) | 131 (16.6) | 163 (6.2) |
| Medical assistant | 23 (1.9) | 4 (0.7) | 117 (14.8) | 144 (5.5) |
| Licensed practical or vocational nurse | 11 (0.9) | 75 (12.4) | 22 (2.8) | 108 (4.1) |
| Physician | 76 (6.2) | 2 (0.3) | 24 (3.0) | 103 (3.9) |
| Food services staff | 36 (2.9) | 31 (5.1) | 4 (0.5) | 71 (2.7) |
| Environmental services staff | 41 (3.3) | 25 (4.1) | 4 (0.5) | 70 (2.7) |
| Facilities staff | 41 (3.3) | 21 (3.5) | 7 (0.9) | 69 (2.6) |
| Surgical or medical technician | 32 (2.6) | 6 (1.0) | 21 (2.7) | 59 (2.2) |
| Physical therapist or assistant | 26 (2.1) | 14 (2.3) | 5 (0.6) | 45 (1.7) |
| Dental practitioner or dental clinic worker | 2 (0.2) | 0 | 42 (5.3) | 44 (1.7) |
| Pharmacy personnel | 22 (1.8) | 1 (0.2) | 19 (2.4) | 42 (1.6) |
| Nurse practitioner | 22 (1.8) | 6 (1.0) | 12 (1.5) | 40 (1.5) |
| Other | 221 (18.0) | 54 (8.9) | 134 (17.0) | 409 (15.6) |
| Not reported | 1 (0.1) | 0 | 1 (0.1) | 8 (0.3) |

(Continued)
Table 1. (Continued)

| Characteristic                                     | Hospital (N = 1,225) | Nursing Home (N = 604) | Other Facility* (N = 789) | All Facilities (N = 2,625) |
|---------------------------------------------------|----------------------|------------------------|---------------------------|---------------------------|
| Underlying conditions, no. (%)                    |                      |                        |                           |                           |
| At least one underlying condition†                | 817 (66.7)           | 437 (72.4)             | 581 (73.6)                | 1,836 (69.9)              |
| Obesity or severe obesity                        | 375 (30.6)           | 236 (39.1)             | 292 (37.0)                | 903 (34.4)                |
| Hypertension                                      | 151 (12.3)           | 118 (19.5)             | 147 (18.6)                | 416 (15.8)                |
| Asthma                                            | 159 (13.0)           | 71 (11.8)              | 113 (14.3)                | 343 (13.1)                |
| Diabetes mellitus                                 | 60 (4.9)             | 56 (9.3)               | 63 (8.0)                  | 179 (6.8)                 |
| Current or recent smoker‡                         | 55 (4.5)             | 71 (11.8)              | 51 (6.5)                  | 177 (6.7)                 |
| Autoimmune or rheumatologic disease              | 54 (4.4)             | 21 (3.5)               | 29 (3.7)                  | 104 (4.0)                 |
| Heart condition                                   | 35 (2.9)             | 21 (3.5)               | 20 (2.5)                  | 76 (2.9)                  |
| Pregnancy                                         | 31 (2.5)             | 7 (1.2)                | 23 (2.9)                  | 61 (2.3)                  |
| Chronic obstructive pulmonary disease             | 7 (0.6)              | 7 (1.2)                | 2 (0.3)                   | 16 (0.6)                  |
| Chronic kidney disease                            | 2 (0.2)              | 2 (0.3)                | 3 (0.4)                   | 7 (0.3)                   |

Note. IQR, interquartile range.

†Includes HCP working in home health, outpatient facilities, assisted living facilities, mental health facilities (including psychiatric hospitals), and other nonhospital, non-nursing-home healthcare settings.

‡7 healthcare personnel did not report the type of facility in which they worked but did report other data included in the table.

§Excludes 27 HCP for whom age was not reported (13 working in hospitals, 6 in nursing homes, 4 in other facilities, and 4 with missing facility information).

¶California and Georgia EIPs conducted surveillance in HCP residing in 3 San Francisco-area counties and 5 metropolitan Atlanta counties, respectively. Colorado, Connecticut, Maryland, Minnesota, New Mexico, New York, Oregon and Tennessee EIPs each recruited a convenience sample of hospitals; Colorado and Tennessee EIP also recruited convenience samples of nursing homes. In addition to recruiting a convenience sample of hospitals, New York EIP conducted surveillance among HCP working in nursing homes and residing in Monroe County. Cases reported by participating healthcare facilities could have worked in other settings affiliated with the facility, such as nursing homes or outpatient clinics. Cases were grouped based on the primary facility in which they reported working.

⊥129 HCP reported multiple roles; these were resolved to a single role by reviewing available data (eg, descriptions of “other” roles), considering the amount of direct or indirect patient contact expected for a given role. Generally, in the absence of more information, the role expected to involve more patient contact was assigned.

‖In addition to the conditions listed, includes active cancer, other immunosuppressive conditions, liver disease, other lung disease, and other reported conditions.

§Recent smokers were defined as HCP who quit smoking <1 year before the interview date.

Table 2. Close Contacts With Persons With COVID-19 and Practices and Activities In and Outside the Workplace Among Healthcare Personnel (HCP) With SARS-CoV-2 Infection*

| Close Contact, Practice, or Activity | Hospital (N = 1,225) | Nursing Home (N = 604) | Other Facility* (N = 789) | All Facilities (N = 2,625) | P Value‡ |
|-------------------------------------|----------------------|------------------------|---------------------------|---------------------------|---------|
| Close contacts with persons with COVID-19, no. (%)§ |                      |                        |                           |                           |         |
| In any setting                       | 908 (74.1)           | 406 (67.2)             | 475 (60.2)                | 1,791 (68.2)              | .004    |
| In the workplace, with patients with COVID-19 | 541 (44.2)           | 305 (50.5)             | 164 (20.8)                | 1,010 (38.5)              | .008    |
| In the workplace, with someone with COVID-19 other than a patient¶ | 82/554 (14.8)        | 44/142 (31.0)          | 41/241 (17.0)             | 167/937 (17.8)            | <.001   |
| Outside the workplace                | 349 (28.5)           | 51 (8.4)               | 270 (34.2)                | 670 (25.5)                |         |
| With a family member with COVID-19   | 241 (19.7)           | 41 (6.8)               | 211 (26.7)                | 493 (18.8)                | <.001   |
| With someone with COVID-19 other than a family member | 120 (9.8)            | 11 (1.8)               | 64 (8.1)                  | 195 (7.4)                 | <.001   |
| In the workplace, no. (%)            |                      |                        |                           |                           |         |
| Always used the following during care of patients with COVID-19: |                      |                        |                           |                           |         |
| Mask or respirator                   | 510/541 (94.3)       | 276/305 (90.5)         | 141/164 (86.0)            | 927/1,010 (91.8)          | .043    |
| Gloves                              | 492/541 (90.9)       | 268/305 (87.9)         | 121/164 (73.8)            | 881/1,010 (87.2)          | .140    |
| Gown                                | 387/541 (71.5)       | 187/305 (61.3)         | 52/164 (31.7)             | 626/1,010 (62.0)          | .002    |
| Goggles or face shield              | 381/541 (70.4)       | 191/305 (62.6)         | 52/164 (31.7)             | 624/1,010 (61.8)          | .019    |
| Always cared for patients with COVID-19 who had source control in place‖ | 116/541 (21.4)       | 17/305 (5.6)           | 54/164 (32.9)             | 187/1,010 (18.5)          | <.001   |
| Always practiced social distancing with coworkers in the workplace | 233 (19.0)           | 192 (31.8)             | 309 (39.2)                | 735 (28.0)                | <.001   |
| Had a mucous membrane or skin exposure to body fluids from patients with COVID-19 | 55/541 (10.2)        | 40/305 (13.1)          | 24/164 (14.6)             | 119/1,010 (11.8)          | .023    |
| Practiced extended use or reuse of a respirator during care of patients with COVID-19§ | 161/205 (78.5)       | 34/58 (58.6)           | 19/43 (44.2)              | 214/306 (69.9)            | .002    |
| Always practiced universal masking in the workplace | 986 (80.5)           | 498 (82.5)             | 589 (74.7)                | 2,074 (79.0)              | .325    |

(Continued)
COVID-19 and participation in selected activities that may be associated with increased exposure risk. Focused messaging emphasizing community prevention practices may be needed.

Our findings have 2 main limitations. First, we analyzed data from a convenience sample of facilities and HCP; thus, results likely are not generalizable to all US HCP. Second, participation by HCP working in different healthcare settings was not proportionate across sites; therefore, differences observed between H-HCP and NH-HCP could be explained by other factors not accounted for in this analysis, such as differences among sites or healthcare settings in demographics, underlying conditions, or healthcare roles.

The US healthcare workforce is diverse, and protection of this workforce is essential to the safety and well-being of the nation. Recognition of the differences in workplace and community factors that affect the risk for SARS-CoV-2 infection among HCP may inform the development and delivery of effective public health outreach and messaging.

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