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Infection precaution adherence varies by potential exposure risks to SARS-CoV-2 and job role: Findings from a US medical center

Emily J. Haas, PhD[a,*], **Kaitlin Kelly-Reif, PhD**[b], **Mihili Edirisooriya, PhD**[a], **Laura Reynolds, MPH, BSN, RN**[c], **Cherese N. Beatty Parker, MPH**[d], **Deanna Zhu**[e], **David J. Weber, MD, MPH, FIDSA, FSHEA, FRSM**[e,f], **Emily Sickbert-Bennett, PhD, MS, CIC, FSHEA**[e,f], **Ross M. Boyce, MD, MSc**[f], **Emily J. Ciccone, MD, MHS**[f], **Allison E. Aiello, PhD**[d]

[a]National Personal Protective Technology Laboratory, National Institute for Occupational Safety and Health, Pittsburgh, PA

[b]Division of Field Studies and Engineering, National Institute for Occupational Safety and Health, Cincinnati, OH

[c]Respiratory Health Division, National Institute for Occupational Safety and Health, Morgantown, WV

[d]Department of Epidemiology and Robert N. Butler Columbia Aging Center, Columbia University, New York, NY

[e]Department of Infection Prevention, University of North Carolina Medical Center, Chapel Hill, NC

[f]Division of Infectious Diseases, University of North Carolina School of Medicine, Chapel Hill, NC

Abstract

Background: Infection precautions (IP) facilitate standardized and safe patient care. Research has demonstrated several barriers to IP adherence among health care personnel (HCP) but potential exposure risk to SARS-CoV-2 and job role has not been considered.

Methods: Researchers used self-reported baseline surveys with 191 HCPs at a university medical center to examine factors that may have affected IP adherence (eg, personal protective equipment [PPE] and hand hygiene errors) over the 2 weeks prior to the survey. Chi-square tests were used to determine if differences existed first, among job role and IP adherence, and second, the potential risk of exposure to SARS-CoV-2 and IP adherence. A binary logistic regression estimated if PPE nonadherence was associated with COVID-19 stress, job role, and potential exposure risk to SARS-CoV-2.

[*]Address correspondence to Emily J. Haas, 626 Cochrans Mill Rd., Pittsburgh, PA 15236. wcq3@cdc.gov (E.J. Haas).

Ethics approval and consent to participate: This study was reviewed, and determined that the risk involved was no more than minimal by the blinded IRB (Protocol #20–0942). All individuals provided informed consent prior to participation.

CODE AVAILABILITY

SPSS v26 was used to code and analyze the data.

Conflicts of interest: AEA reports consulting with Analysis Group Inc.

Results: PPE nonadherence varied by job role. Those in the *Other* group (ie, nonphysician/non-nursing HCP) reported significantly fewer errors (9.6%) compared to *Physicians* (26.5%) and *Registered Nurses* (33.3%). Hand/glove hygiene errors between COVID-19 patient rooms varied by job role. Respondents who had higher risks of exposure to SARS-CoV-2 were 5.74 times more likely to experience errors.

Conclusions: The results provide implications for adopting systems-level approaches to support worker knowledge and engagement across job roles to improve IP adherence.

Keywords

COVID-19; Health care personnel; Job task exposure; Personal protective equipment; Socio-technical systems

BACKGROUND

Due to frequent and prolonged patient care provided by health care personnel (HCP) during the COVID-19 pandemic, exposure and subsequent infection risks have been an elevated concern for many hospital employees.[1] Standard precautions and transmission-based precautions, collectively referred to here as infection precautions (IP), are fundamental practices intended to prevent HCP exposure to infectious pathogens. IP guidelines include a core set of practices such as hand hygiene and appropriate use of personal protective equipment (PPE), including respiratory protection, medical or surgical masks, face shields, gloves, eye protection, and gowns.[2]

Although IP guidelines exist, standardized adoption is not universal, and adherence to specific practices is suboptimal–often occurring less than 50% of the time.[3–5] Heavy workload and time limitations have been demonstrated as the 2 greatest contributors to low IP adherence.[6,7] Notably, during the COVID-19 pandemic, HCP encountered higher workloads and time limitations in response to these demands,[8] exacerbating already-present barriers to adherence. For example, when workload increases, so does the frequency and pace of PPE donning and doffing, which heightens the risk for self-contamination and infection.[9–11]

Research has focused on specific IP practices (eg, hand hygiene or PPE donning/doffing) and adherence between clinical providers such as nurses and physicians. These studies have shown that nurses have higher hand hygiene adherence in comparison to physicians, although physicians tend to have better adherence than nurses during high-risk scenarios.[12,13] Another study with HCP that included nurses, physicians, and other HCP found that, although awareness of PPE guidance during the COVID-19 pandemic was high (84%), PPE utilization remained relatively low (54%).[14]

To date, most studies have examined IP adherence around hand hygiene and PPE practices among HCP who provide patient care. However, less research has explored differences based on occupational exposure risks. During the COVID-19 pandemic, individuals in a wide range of job roles provided direct care or support to patients infected with SARS-CoV-2 and had to adhere to a list of IPs. For example, physical therapists, occupational therapists, dieticians, and support workers had direct interaction with patients, necessitating the use of respiratory protection and specific hand hygiene practices.[15–17] To the authors' knowledge, the inclusion of these *Other* job positions to examine IP adherence is novel.

In the current study, which was part of a larger prospective cohort of HCPs during the COVID-19 pandemic,[15] researchers examined associations between HCP IP adherence and potential explanatory factors, including job role, potential risk of exposure to SARS-CoV-2 (via self-reported tasks), and perceived stress toward COVID-19. During the time of this study, the medical center's protocol indicated that PPE use was required regardless of patients' COVID-19 status and job tasks being performed throughout the medical facility, including the use of gowns, gloves, eye protection, and N95 filtering facepiece respirators.

METHODS

The University of North Carolina Medical Center cohort

For this study, the the National Institute for Occupational Safety and Health (NIOSH) collaborated with the University of North Carolina Medical Center (UNCMC), who led a large prospective cohort study to understand the transmission dynamics of SARS-CoV-2 among HCP and their household contacts during the COVID-19 pandemic. UNCMC is a tertiary care facility in North Carolina that has over 800 beds. Study protocols were reviewed by the Institutional Review Board at the University of North Carolina and received an expedited review under 45 Code of Federal Regulations (CFR) 46.110. Additionally, this activity was reviewed by the Centers for Disease Control and Prevention (CDC) and was conducted consistent with applicable Federal law and policy.[a]

Researchers enrolled 213 participants between July 5, 2020, and January 4, 2021. Regarding the timing of this study, the COVID-19 vaccine became available to employees in mid-December 2020. So, most enrollees completed their baseline survey prior to vaccination, although there were 2 individuals who enrolled after receiving their first vaccine. Inclusion criteria required participants to be employed at the University of North Carolina (UNC) and actively providing patient care or support services in the emergency department, inpatient wards, intensive care units, and/or respiratory diagnostic center during the COVID-19 pandemic; planned to be employed by the medical center for the duration of the study; willing and able to provide informed consent; and access to stable internet, email, and a computer at home.

If individuals met these criteria, they were given the opportunity to provide written informed consent. During the consent process, individuals were explained that they would not be compensated for their participation and there was no direct benefit to them although a potential benefit included the identification of SARS-CoV-2 infection in asymptomatic individuals, leading to their appropriate isolation and decreased risk of transmission to any contacts at home or work. Upon consent, they received the baseline survey, which took approximately 20 minutes to complete and covered demographic characteristics, including job, infection prevention activities and behaviors, illnesses and health, and psychosocial

[a]1See for example, 45 CFR part 46; 21 CFR part 56; 42 United States Code (USC) §241(d), 5 USC §552a, 44 USC §3501 et seq.

health.[15] Shorter biweekly and daily surveys, and collected PPE observation data were also part of participation but not included in this analysis. For more information about the full study design, see the article published by Ciccone and colleagues[15]. In this study, UNCMC researchers conducted a secondary analysis of deidentified data, focusing only on the baseline surveys.

Variables

Job role—Respondents were selected from a prepopulated list of 11 different job roles. These categories were maintained for the analysis, with seldomly selected job roles being recoded into the most applicable ones. Advanced practice providers, physician assistants, and nurse practitioners (n = 8), were included with *Physicians* (n = 77). *Registered nurses* (n = 52) remained the same. Thirty-eight respondents identified as *Other* or were reassigned to *Other*, reporting a variety of jobs, including respiratory therapist, speech therapist, clinical dietician, environmental services, occupational/physical therapist, and food services (n = 54).

Potential exposure to SARS-COV-2—As a measure of potential exposure to SARS-CoV-2, we assessed job tasks among respondents who reported coming into contact with patients who were known or suspected to have SARS-CoV-2 within the 2 weeks prior to survey completion. Respondents were asked to self-report (1) specific tasks that entailed patient care or support services around patients known or suspected to be positive for SARS-CoV-2 (using a standardized list of aerosol and nonaerosol generating procedures); (2) number of times these tasks were completed in the past 2 weeks; and (3) duration of the procedure or service.

Respondents who reported performing a specified list of aerosol-generating procedures were deemed to have a job with a higher risk of potential exposure to SARS-CoV-2. Examples of procedures included performing manual (bag) ventilation, breaking the ventilator circuit, and performing or assisting with intubation or being present in the room during intubation. The potential risk of exposure was recoded as a dichotomous variable, “High” (1) or “Low” (0). “High” represented a higher probability of exposure to SARS-CoV-2 (defined as performing a higher-risk procedure on a patient suspected or known to have COVID-19 in the past 2 weeks), and “Low” represented a much lower risk of exposure based on tasks reported.

Adherence via self-reported PPE errors—The incorrect use of PPE and incorrect use of hand hygiene practices were measured using self-reported answers to 3 questions that queried how many times they: (1) incorrectly donned/doffed PPE during the last 2 weeks; (2) missed a hand or glove hygiene step during PPE donning/doffing procedures during the last 2 weeks; and (3) forgot to perform hand or glove hygiene between patient rooms where COVID-19 patients were cohorted and PPE donning/doffing occurred at the entrance to the ward. The final variable combined the frequency of these 3 errors and then collapsed into “Nonadherence” or “Adherence” because most respondents reported zero errors.

Although these adherence and nonadherence answers were self-reported, study staff in COVID-19 treatment wards collected validation data by routinely observing HCP PPE and hand hygiene practices.[15,18] The PPE observers were hired by the research team, trained on the errors and practices to observe, and then observed 4 patients per shift. These study staff were on the study protocol, and current medical students were familiar with the health care environment in which the study took place. This additional observation did not serve as a study variable but provides a bystander perspective of PPE errors and a quantitative comparison to self-reported IP adherence. Observations were recorded behind glass doors in the emergency department, intensive care unit, and an inpatient floor with COVID-19 beds. These departments/units were selected because patient rooms are behind glass doors, allowing observation of in-room procedures.

Members of the study staff were stationed in the areas in which care for patients with suspected or confirmed SARS-CoV-2 infection most often took place. At least 1 observer covered each of the following areas 3 times weekly for a 2 to 3 hours shift each time: the D Bay in the Emergency Department (where patients suspected of having SARS-CoV-2 infection were cohorted), the inpatient ward for SARS-CoV-2-infected patients, the intensive care unit, respiratory diagnostic center, and a hospital floor with overflow COVID-19 beds. In addition, observers covered one ward each week where there were no SARS-CoV-2-infected patients to serve as a comparison. Most observations occurred in the Intensive Care Unit. Observers collected aggregate (unit-level) data regarding PPE use and availability, HCP-patient interactions, and hand hygiene on a standardized electronic form.

COVID-19 stress—To measure COVID-19 stress, participants were asked if, during the last 2 weeks, they experienced any stress-related scenarios among a provided list due to the COVID-19 pandemic and prompted with a “Yes” (1) or “No” (0) response option. Examples of questions included “I felt I had little control over whether I would get infected or not,” “I was afraid of falling ill with COVID-19,” and “I thought about resigning because of COVID-19.” Eight questions were averaged to create a composite item (Cronbach’s alpha = 0.78) ranging from 0 to 1 (Mean [M] = 0.36, standard deviation [SD] = 0.28). A higher score indicated a higher level of stress associated with COVID-19.

Data analysis—Data was analyzed using IBM SPSS 26. Besides descriptive analyses for the variables of interest, a X^2 test (2-tailed) was conducted to determine if statistically significant differences existed among (1) respondents’ job position and IP adherence and (2) potential risk of exposure to SARS-CoV-2 and IP adherence. A binary logistic regression model was used to determine whether respondents’ PPE errors differed when controlling for COVID-19 stress, job, and potential exposure to SARS-CoV-2.

RESULTS

The respondents were predominantly female (69.5%) and White (81%) but reported a variety of job roles that were organized into 3 primary groups. Specifically, 85 participants (44.5%) reported being a physician/physician assistant or nurse practitioner and, in terms of experience, averaged 5.8 years on the job (SD = 5.7); 52 (27.2%) reported being a registered nurse or similar role and averaged 5.6 years on the job (SD = 5.5). Finally, a variety of job roles were grouped in the other category (N = 54, 28.3%) and averaged 5.3 years of experience (SD = 4.4).

Of the 191 participants who completed the entire baseline survey, 167 (87%) reported coming into contact with patients not known or suspected to be positive for SARS-CoV-2, and 129 (68%) reported coming into contact with patients known or suspected to have COVID-19 within the 2 weeks prior to the survey completion. Regarding PPE availability, 93% of workers reported always having access to gowns, 99% to gloves, 98% to eye shields, and 98% to face masks in the prior 2 weeks. Table 1 shows descriptive statistics for the number of PPE errors by job role.

Job role and IP adherence

A X^2 test showed that the relationship between job role and cumulative errors was statistically significant, X^2(df = 2, N = 186) = 8.694, $P < .013$. The *Other* job group reported significantly fewer errors (9.6%) compared to the *Physician* (26.5%) and *Registered nurse* groups (33.3%). The X^2 analysis indicated that the relationship between respondents' job role and their hand or glove hygiene errors between COVID-19 patient rooms was statistically significant, X^2(df = 2, N = 100) = 11.48, $P < .003$, with 23.7% of those in the *Physician* group and 33.3% of those in the *Registered nurse* group experiencing one or more hand or glove hygiene errors between patient rooms as opposed to no errors reported among those in the *Other* job group.

There were no statistically significant differences among *Physicians*, *Registered nurses*, and those in the *Other* group when assessing differences in the PPE errors measured. Even though no statistically significant difference was found, a higher percentage of *Physicians* and *Registered nurses* were categorized as nonadherent (reporting at least one instance of either PPE error) in comparison to the *Other* group (see Table 2).

Potential exposure risk to SARS-CoV-2

In addition to job role, 41.2% of the respondent sample self-reported tasks that placed them at a higher risk of potential exposure to SARS-CoV-2. For all these respondents, they reported exposure to these patients for at least 1 hour. The average risk of potential exposure to SARS-CoV-2 among *Registered nurses* was higher (M = 0.57, SD = 0.50) than that of the *Physician* (M = 0.29, SD = 0.46) and *Other* (M = 0.38, SD = 0.49) groups (See Table 3).

A X^2 analysis showed a statistically significant relationship between respondents' job role and their potential risk of exposure, X^2(df = 2, N = 131) = 8.58, $P = .014$, with 57.4% of *Registered nurses* completing job tasks that placed them at a higher risk of exposure to SARS-CoV-2, compared to those in the *Physician* (28.8%) and *Other* (37.5%) groups. The *Other* group noted completing tasks that placed them in a position for increased potential exposure more often than *Physicians*. This is likely because the *Other* group included some respiratory therapists.

Controlling for COVID-19 stress

COVID-19 stress (M = 0.358, SD = 0.284) was generally low on a scale of 0 to 1. *Physicians* COVID-19 stress was (M = 0.326, SD = 0.266); *Registered nurses* (M = 0.438, SD = 0.322); and *Other* (M = 0.358, SD = 0.289). An Analysis of Variance test indicated no statistically significant difference between COVID-19 stress and job role, F(df = 2, 59) = 0.641, P =

.53, η^2 = 0.021. Although not statistically significant, average COVID-19 stress was highest among *Registered nurses*.

A logistic regression assessed the influence of job role and the risk of potential exposure to SARS-CoV-2 on respondents' overall IP adherence while controlling for perceived stress toward COVID-19. Although the results were not statistically significant (P = .223), the Wald test evaluated the statistical significance of each explanatory variable. Using the risk of potential exposure as an explanatory variable significantly improved the null model, which correctly classified 81.1% of cases. Further, 96.4% of respondents who did not report any PPE error were correctly predicted by the model. Based on the results, the odds of having at least one PPE error were 5.74 times greater for respondents who had a higher risk of potential exposure to SARS-CoV-2 as opposed to those who had a lower risk of exposure (based on job tasks), controlling for job role and perceived risk.

PPE observation sessions

Although participants were asked to reflect on the previous 2 weeks when reporting errors, these results are still subject to recall bias. To supplement and further validate the self-reported surveys, which may suffer from recall bias, PPE observations by study staff produced 68 observation sessions of 170 employees. In general, the PPE observation sessions validate the self-reported findings both in proportions of errors observed and the breakdown in job roles from which those errors were occurring. For example, the proportion of personnel who adhered to PPE protocol was observed to be high in both self-reported and observed measures. Adherence to hand/glove hygiene was high during observation sessions; gloves were observed to be used correctly 95% of the time, with *Physicians* being the least adherent (89% glove use) and the *Other* group being most adherent (98% glove use) as was observed in the self-reported results by job type shown in Table 2.

Results for other PPE adherence (eg, gowns, N95 filtering face-piece respirators, eye protection) demonstrated similar trends. One notable difference between observed and self-reported data was that the proportion of personnel who adhered to proper hand hygiene between patient rooms was lower in observed sessions than in self-reported data. However, this was also the self-reported category with the least overall adherence. Hand/glove hygiene between COVID-19 patient rooms were only observed to be adhered to 40% of the time. In the observation sessions, after *Registered Nurses* (57%), most job roles entering patient rooms were considered *Other* workers (32%). Similar to the survey, the *Other* category represented a variety of job types, including environmental health services, certified nursing assistants, and different technicians. *Physicians* represented a higher proportion of survey respondents (44.5%) than they represented observed job types entering patients' rooms (11%).

DISCUSSION

This study collected objective and subjective information from HCP during the height of the COVID-19 pandemic. Results pose new directions for research that involve other job roles and mechanisms to improve work processes and systems to enhance elements of a positive safety climate in health care settings. Specifically, results indicate the need to broaden engagement in emergency preparedness and response training to include all personnel interacting with patients. Second, there is a need for system improvements via a review of job and task design to reduce employee burden, which was associated with errors.

Results also support previous research, showing different levels of IP adherence between physicians and nurses in various scenarios. For example, results align with previous findings in that physicians often have better adherence during higher-risk scenarios[12,13] such as close contact with COVID-19 patients. However, registered nurses may have had higher workloads during this time, which could lead to more obvious errors.[11,12] To illustrate, Harrod and colleagues[19] found that barriers related to time, the number of patients, and the need for quick entries/exits were the main reasons for ineffective or no PPE donning. The remainder of this paper focuses on the 2 new research directions highlighted above.

Involving other job groups in emergency preparedness

First, findings from participants showed that all 3 major job groups were completing tasks with/around patients who were infected with SARS-CoV-2 *and* were making errors associated with PPE utilization and hand hygiene, showing the need to improve emergency preparedness and response training. Research during the COVID-19 pandemic supports these points, indicating that training content and methods must be improved,[19] and that hospital cleaning personnel were an under-recognized group for improving patient safety.[16] Further, interviews with environmental health service employees during the COVID-19 pandemic revealed the need for ongoing training and education to recognize and prepare these employees as frontline responders to support and protect patients.[17] Consequently, all job groups in health care settings need training about correct PPE donning and doffing, proper hand hygiene, and other guidelines.

The current study also shows that all clinical staff are crucial for HCP safety and the need to understand infection risk beyond physicians and nurses. Although all respondents were potentially exposed to patients who had COVID-19, some respondents' job tasks could have been new for employees in certain positions due to staff resources. In other words, it is unclear if those in *Other* job roles were performing new/additional tasks, and, if so, if this could have impacted IP adherence. In comparison, the design of some job tasks may have not lent themselves to adherent practices during the pandemic and should be reassessed and, if necessary, addressed through a systems approach as described below.

Engaging a socio-technical systems approach

Looking at results across all job roles, respondents who had a higher risk of potential exposure to SARS-CoV-2 were 5.74 times more likely to experience errors than respondents who had a lower risk of exposure. Although multiple possibilities can be attributed to this outcome, one can argue that repetitive tasks can lead to complacency and less attention to detail, resulting in more errors. Also, because this was a novel epidemic, the relationship among repetitive tasks and constantly changing policies, procedures, and information, could have also impacted the errors experienced among respondents.

Additionally, the higher risk of potential exposure could be attributed to higher workloads, fatigue, and stress levels, prompting the need to identify more systems-level approaches to support worker knowledge and engagement and improve attitudes and adherence behaviors. For example, previous research has attributed issues of IP adherence around hand hygiene and PPE doffing/donning to poor safety climate[3,4] and gaps in workplace processes and training.[20] These issues support alignment with a socio-technical systems (STS) approach to better address workplace processes and barriers to adherence in health care.[21,22]

An STS approach engages the interdependencies of organizational design and social processes to improve performance. For example, Sax and Clack[23] argued that the inability of trainers and mentors to establish mental models for their workforce during training may lead to breakdowns in hand hygiene adherence. In the example of hand hygiene adherence, one way that an STS approach would facilitate accurate mental models is by the purposeful placement of dispensers that are convenient and noticeable for workers.[20] Other research has shown that dispenser visibility and proximity to patient room entrances significantly increase adherence, while standardization of their placement across an organization may not.[24] In other words, examining the work processes for different jobs and strategically providing touchpoints–whether a dispenser, place to acquire PPE, or information about effective PPE doffing/donning–may be a useful consideration for the current study cohort rather than standardizing where these resources are placed on each floor or ward, for example. Previous research at UNCMC[15] concluded that standardizing guidelines and workflows specific to the needs of each unit led to increased comprehension among department HCP, including staff that floated across units.[25]

Further, a previous study found that attitudes toward COVID-19 related to perceived risk and stress were associated with higher IP adherence, including PPE doffing/donning.[26] The current study results did not have this same association, with the average number of errors being higher when doffing/donning PPE and performing proper hand hygiene between COVID-19 patient rooms. Additionally, those who performed tasks that put them at a higher risk for potential exposure to SARS-CoV-2 were more likely to experience an error than those at a lower risk for exposure. Therefore, gaps in workplace processes that could be improved via an STS approach, or by addressing components of a positive safety climate may be important to improve IP adherence, especially during emergency response scenarios. Future analyses should examine the workplace processes of these major job roles during the COVID-19 pandemic more in-depth to identify possible interventions in the future.

Specifically, previous research has shown that attitudes toward hand hygiene and PPE are often better/higher than the targeted health behavior.[27] However, systematic reviews[3,4,28] have shown that nurses' adherence to safety practices and IP adherence during routine operations and tasks are often associated with their knowledge, attitudes, and perceptions of the organization's safety climate. Previous research[3,4] measured supervisor expectations and actions promoting patient safety, teamwork within and across units, communication openness, and feedback and communication about errors as separate safety climate dimensions. Better teamwork within units as well as the importance of detailed handoffs and transitions were noted as impacting safety climate, suggesting that these are important areas to consider in future research and interventions among this cohorted group.

LIMITATIONS

The results of this study must be considered with its limitations. First, there is potential selection bias in the cohort in that study participants, who volunteered to participate, may be systematically different than those who elected not to participate. Second, the study was conducted at a relatively high-resource, tertiary care hospital, which may limit generalizability to other settings. Notably, access to PPE was not an issue, and reported COVID-19 stress was low during a time when other research illustrated high-stress levels and negative impacts on mental health. While the inclusion of other job roles is novel and thus a strength of the study, it also has important limitations. Surprisingly, the results showed that those in other job roles were performing many tasks that brought them in contact with patients infected with SARS-CoV-2. However, we do not know if these tasks were temporary or routine, which may impact how these results can be compared both within and across groups. Further, HCP in *Other* roles represented a heterogeneous range of occupations.

Considering the results of the current study, it would have been ideal to have enough professionals in other roles to have a greater variety of job roles in separate groups. The research team did engage in targeted recruitment efforts with some of these job roles. For example, English and Spanish materials were developed to target environmental services employees, but this effort yielded little success. However, because this was a secondary analysis of an existing cohort, identifying even distribution among various groups was not an initial priority in the protocol. It is also possible that the influx of COVID-19 studies that were occurring during this same period limited the ability of those in *Other* job roles to participate. Finally, not all job tasks that were included in the study were evenly distributed among the respondent job roles and units, and errors were collected as counts rather than rates. Therefore, certain respondents were more likely to experience tasks that placed them at a higher risk of potential exposure to SARS-CoV-2. The perceived higher risk may also have influenced their recollection of mistakes in hand washing and PPE usage.

CONCLUSIONS

These study results reinforced the need to provide systemic solutions to infection control standards, since ancillary staff are not isolated from COVID-19 patients, and they often play an important role in infection prevention for patients and staff. While the results support previous research within certain jobs, they also elucidate that all employees in health care settings face exposure risks, may require similar training, and must be considered when developing workflow processes that support IP adherence. An STS approach may support such activities. Relatedly, any knowledge-building trainings or activities should be complemented with systems-level support to include leadership, teamwork, and accessible policies.

DISCLAIMER

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention. Mention of any company or product does not constitute

endorsement by the National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention.

Availability of data and materials:

Data are not publicly available due to the potential for individual identification. For questions regarding the use of the data or for those interested in working with the data, please contact Allison E. Aiello at aea27@cumc.columbia.edu.

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Table 1

Descriptive statistics of PPE errors in the past 2 wk

Role	Breach type	N	Frequency distribution of errors reported	Mean PPE errors in past wk*	SD
Physician/Physician assistant/Nurse practitioner		85			
	PPE donning/doffing errors	83	0 to 2	0.1	0.4
	Hand/glove hygiene errors	82	0 to 21	0.8	3.0
	Hand/glove hygiene errors between COVID-19 patient rooms	35	0 to 11	0.9	2.3
Registered nurse		52			
	PPE donning/doffing errors	49	0 to 1	0.0	0.1
	Hand/glove hygiene errors	50	0 to 5	0.3	1.0
	Hand/glove hygiene errors between COVID-19 patient rooms	36	0 to 11	1.2	2.4
Other (eg, environmental services, occupational/physical therapist, radiology technician, food services)		54			
	PPE donning/doffing errors	52	0 to 1	0.0	0.1
	Hand/glove hygiene errors	52	0 to 6	0.2	0.9
	Hand/glove hygiene errors between COVID-19 patient rooms	29	0	0.0	0.0

N, number; *PPE*, personal protective equipment; *SD*, standard deviation.

* A higher mean indicates an increase in the number of errors. The mean shown indicates, on average, on many errors each individual participant recalled and self-reported in the survey from the previous 2-wk time period.

Table 2

Self-reported survey results: Infection precaution adherence by respondent job role

IP adherence measure	Job role			Total (%)
	Physician (%)	Registered nurse (%)	Other (%)	
Cumulative PPE adherence	73.5	66.7	90.4	76.3
PPE donning/doffing adherence	92.8	98.0	98.1	95.7
Hand/glove hygiene adherence	81.7	88.0	92.3	86.4
Hand/glove hygiene adherence instances between COVID-19 patient rooms	74.3	66.7	100.0	79.0

IP, infection precaution; *PPE*, personal protective equipment.

Table 3

Potential risk of SARS-CoV-2 exposure by job group

	Potential exposure risk to SARS-CoV-2	
Job role	**Low (%)**	**High (%)**
Physician/Physician assistant/Nurse practitioner	71.2	28.8
Registered nurse	42.6	57.4
Other	62.5	37.5
Total	58.8	41.2