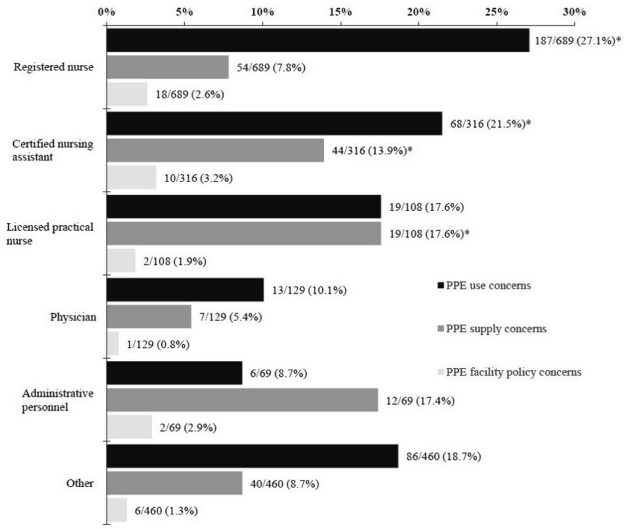
Figure 2. Personal protective equipment (PPE) concerns reported by HCP cases with close contact with COVID-19 patients, stratified by healthcare role, April 2020–January 2021



* p<0.05 using mid-P or Fisher exact test when compared with the percentage of physician cases reporting the same PPE concern type

Conclusions: Although lower percentages of HCP cases overall reported PPE concerns after the first US peak, our results highlight the importance of developing capacity to produce and distribute PPE during times of increased demand. The difference we observed among selected groups of cases may indicate that PPE access and use were more challenging for some, such as nonphysicians and nursing home HCP. These findings underscore the need to ensure that PPE is accessible and used correctly by HCP for whom use is recommended.

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Improved assay for detecting SARS-CoV-2 from nonporous hospital surfaces using surrogate human coronavirus OC43

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Background: Understanding SARS-CoV-2 persistence on surfaces can help inform transmission risk from surfaces in healthcare and community settings. A sensitive viral infectivity assay is crucial for the detection of infective virus in environmental investigations. The conventional cell culture-based infectivity assay is limited by the time dependence, subjectivity, and insensitivity of cytopathic effect (CPE) scoring. We validated an integrated cell-culture and reverse-transcription quantitative RT-PCR method (cc-RT-qPCR) to improve SARS-CoV-2 detection and reduce detection time. We compared cc-RT-qPCR with CPE-scored cell culture to evaluate assay sensitivity of recovered virus from stainless-steel coupons simulating nonporous healthcare surfaces. **Method:** Human ß-coronavirus OC43, a model strain for SARS-CoV-2, was propagated on HRT-18G cells in growth medium at 33°C in a 5% CO_2 incubator. The OC43 infectivity was determined by cell culture with a 10-fold dilution series of viral samples in 96-well plates, and incubation for 7 days at 33°C to confirm CPE. Plates were CPE-scored and TCID50 was calculated using the Reed-Muench method. For the cc-RT-qPCR assay, CPE-negative wells were interrogated for viral intracellular replication using RT-PCR; infectivity was based on a titer increase of ≥ 2 logs 7 days after inoculation using RT-qPCR. CPE-positive or replicative virus-harboring cells were enumerated to determine $TCID_{50}$. The sensitivity of both CPE-scored cell culture and cc-RT-qPCR assays were evaluated by inoculating 105 $TCID_{50}$/mL OC43 in infection media and artificial saliva matrices onto coupons and dried in an environmental chamber at 26°C and 57% relative humidity for 6 hours. Viral eluates from coupons served as test samples. **Results:** Low-titer infectious OC43 (0.75 log10) was detected by both methods 7 days after incubation; however, infectivity confirmation required 4 and 6 days after incubation, respectively, for cc-RT-qPCR and CPE-scored cell culture methods. When cells were inoculated with OC43 at titer range 1.75–4.75 log_{10}, CPE presented at 4–5 days after incubation, while viral replication was already detected at 3 days after incubation via RT-PCR. Upon virus titration, cc-RT-qPCR demonstrated greater sensitivity, detecting up to 1 log_{10} higher of infectious OC43 than cell culture alone at 0 and 6 hours ($P \leq .05$) dried in infection medium and 0 hours ($P \leq .05$) in saliva. **Conclusions:** Our data demonstrated greater sensitivity and shorter times to detect viral replication by cc-RT-qPCR, minimizing potential for false-negative results with cell culture alone. This sensitive assay may provide investigators with quicker results for informing infection control practices to reduce risk of transmission from deposited bodily fluids on surfaces, eg, coughing and sneezing.

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Work system factors affecting COVID-19 PPE use: A human factors approach to analysis of video recordings of emergency department clinical work

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Background: The effectiveness of PPE in preventing self-contamination of healthcare workers (HCWs) and transmission of pathogens (airborne and contact) in the emergency department (ED) is highly dependent on consistent, appropriate use of and other interactions (eg, storing, cleaning, etc) with the PPE. Pre–COVID-19 studies focused primarily on individual HCW contributions to incorrect or suboptimal PPE use. We conducted an analysis of ED video recordings using a human-factors engineering framework (ie, The Systems Engineering Initiative for Patient Safety, SEIPS), to identify work-system–level contributions to inappropriate PPE usage by HCWs while they provide care in their actual clinical care environment. **Methods:** In total, 47 video sessions (each ~15 minute) were recorded between June 2020 and May 2021 using a GoPro camera in an 8-bed pod area, designated for persons under investigation (PUI) and confirmed COVID-19–positive patients, in an ED of a large, tertiary-care, academic medical center. These recordings captured a 'landscape view': 2 video cameras were set up to capture the entire ED pod area and HCWs as they provided care. A team with hemorrhagic fever expertise, infection prevention and control expertise, and ED expertise reviewed each video together and extracted data using a semistructured form. **Results:** Guided by the 5 components of the SEIPS work system model, (ie, task, physical environment, person, organization, tools and technology), multiple work system failure points influencing HCWs appropriate use of PPE were identified. For example, under the task component, HCWs were observed not doffing and donning in recommended sequence. Also, inconsistencies with COVID-19 status signage on a patient's door and ambiguous labelling of work areas designated as clean (donning) and dirty (doffing) sites acted as a barrier to appropriate PPE use under the physical