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Letter to the Editor

Adopting fresh air ventilation may reduce the risk of airborne transmission of SARS-CoV-2 in COVID-19 unit

Dear Editor,

With great interest we read the recently published letter by Julian and colleages highlighting the possibility of influenza airborne transmission as a result of using nebulizers.[1] In the context of COVID-19, the use of nebulizers and other breathing aid devices is routine in the medical settings. However, high amounts of aerosols generated by these devices can expose healthcare workers and other patients to infectious particles thus increasing their risk of morbidity and mortality.[2]

Air samples have been shown to contain viable SARS-CoV-2 collected up to four meters away from COVID-19 patients in hospital rooms and isolation care units, and it was found that the viral load was significantly higher in patients fitted with a nasal cannula.[3] The risk of airborne transmission of infectious agents can be mitigated by ventilation strategies.[4] Since the majority of SARS-CoV-2 transmission occurs indoors,[5] efficient ventilation systems that can dilute the viral concentration in the air is highly desirable.

Recently, a surge of COVID-19 cases among our emergency department (ED) COVID-19 unit's staff involving 22% of the HCWs (3/20 physicians, 8/26 residents and housestaff, and 19/90 nurses) coincided with the national peak of COVID-19 cases averaging around 100,000 cases per month during that period. In contrast, only 3 COVID-19 cases were recorded among our 20 physicians during the proceeding 10 months. Case loads that exceeded our inpatient hospital capacity led to around 300 COVID-19 patients per month boarding in our 34 bed ED COVID-19 unit. Therefore, a decision was made to convert the ventilation settings from a 5.9 air changes per hour (ACH) with a 35% recirculated air and 65% fresh air to 5.9 ACH with 100% fresh air only. We aimed to assess the risk of exposure of healthcare workers by measuring SARS-CoV-2 viral load in air samples following the change in ventilation strategy.

Air samples were collected inside the ED COVID-19 unit using the Coriolis µ microbial air sampler (Bertin Technologies) at a flow rate of 200 L/min for 20 min over two consecutive days. Air samples were collected in the COVID-19 unit hallway, near the staff station, and in patient rooms. Negative control samples were collected at the beginning and end of each sampling day. In addition, swabs or air vents from within the unit were also collected for analysis. The SARS-CoV-2 viral load (gene copy number) in each sample was then assessed using quantitative real-time reverse transcriptase polymerase chain reaction (qRT-PCR) targeting the ORF1b gene (further details available upon request).

Sixteen COVID-19 patients (full capacity) were present in the unit during sampling. They were wearing either a surgical mask or a breathing aid device . Four air samples were collected in the COVID-19 unit hallway, and five return air vents from the same locations were also swabbed for analysis (Fig. 1). In addition, four patient rooms were air sampled at a distance of one meter away from the patient. The patients in the sampled rooms were either intubated, fitted with a high-flow nasal cannula, a BiPAP (bilevel positive airway pressure), or wearing a surgical mask.

All air samples tested negative for SARS-CoV-2 RNA. Consistently, all air vent swabs were negative, indicating either minimal (below detection limit) or absence of SARS-CoV-2 in the air inside the COVID-19 unit during the sampling period following changing air ventilation to 100% fresh air. Therfore, we expect no or minimal risk to the staff under these conditions especially with the proper use of PPEs.

Our findings are in contrast with previous studies reporting the detection of SARS-CoV-2 infectious particles and RNA in air samples collected from ICUs and airborne infection isolation rooms (AIIRs).[6] In our study, all the patients were ED boarders; *i.e.*, patients requiring inpatient care but receiving care in the ED pending hospital bed availability, with an average ED length of stay of 250 h (range 11–483 h). Except for the patient who was wearing a surgical mask, all patients were exhibiting severe symptoms of COVID-19 and were still in the infectious phase of their illness as judged by their duration of symptoms and illness severity. Hospitalized patients have been shown to shed SARS-CoV-2 for prolonged periods (2–4 weeks from the onset of symptoms.[7] Therefore, although the virological status of the patients in our COVID-19 unit was not confirmed at the time of sampling, it is highly likely that the patients were still shedding virus at the time of sampling and that shutting off air recirculation contributed to the lack of detectable virus in the environmental samples. This is consistent with recommendations to avoid air recirculation, as it can transport infectious particles from one space to another if they are connected through the same ventilation system.[8] Air recirculation was implicated as the primary cause of SARS-CoV-2 transmission between cabins on the Diamond Princess cruise ship during the quarantine period, which fueled the outbreak.[9] Likewise, a study by Shen et al. reported a 34.3% higher risk of transmission caused by air recirculation in a bus with an infected person.[10] Therefore, circulating fresh air into COVID-19 facilities should be considered as one of the means to reduce the viral load in the environment and reduce the risk of exposure by HCWs.

Overall, the results are assuring that by supplying fresh air into the COVID-19 unit the risk of SARS-CoV-2 exposure to staff can be mitigated.

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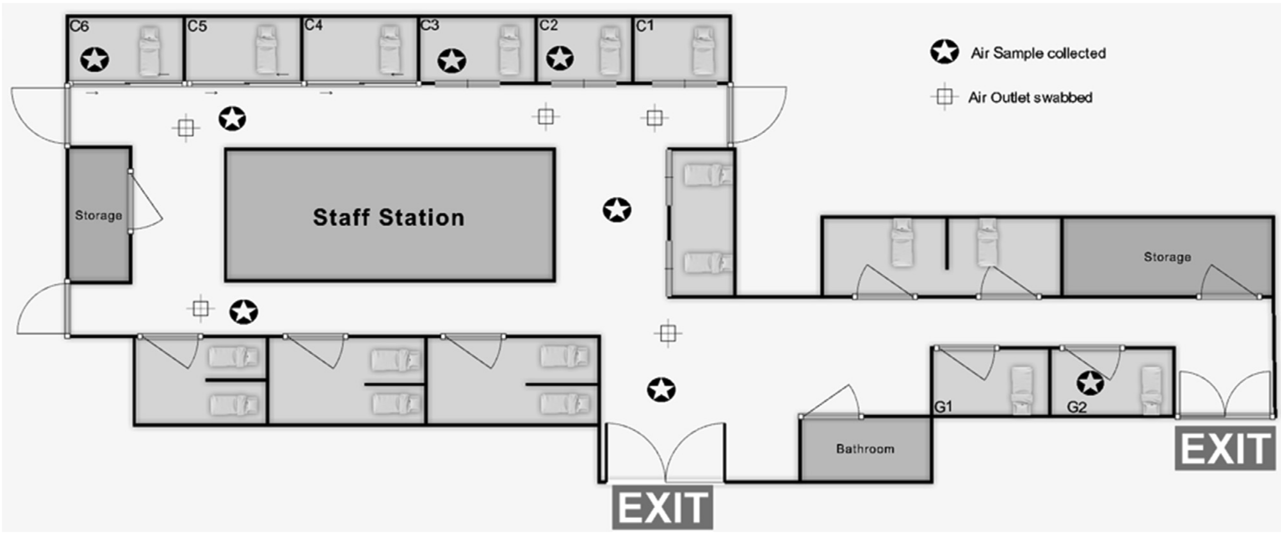

Fig. 1. Layout of the COVID-19 unit indicating sampling locations.

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