Table 1. Aggregate of HCWs Invited to be Vaccinated, Scheduled for Vaccination, and Completed the Vaccine Series[a]

Staff Type	Total Invited	Total Scheduled, No. (%)	Received Second Dose
All YNHH HCW	16,768	12,870	11,885 (70.9% of invited, 92.3% of scheduled)
Medical staff	2,181	1,866 (85.6)	1,746 (80.1% of invited, 93.6% of scheduled)
HCWs on COVID-19 units	202	150 (74.3)	135 (66.8% of invited, 90.0% of scheduled)
HCWs on units with at least 1 HA-COVID-19 case	351	227 (64.7)	197 (56.1% of invited, 86.6% of scheduled)

Note. HCW, healthcare worker; YNHH, Yale New Haven Hospital.
[a]For comparison, medical staff and HCW working primarily on COVID-19 units are included.

The study had several limitations. We were unable to determine potential SARS-CoV-2 exposures and true secondary infections. We classified HCWs to units based solely on primary assignment, so HCWs who performed patient care activities on multiple units or those with secondary unit assignments may have introduced selection bias. Additionally, HCWs may have deferred vaccination due to prior SARS-CoV-2 infection.

We observed a relatively low frequency of HA-COVID-19 cases. These results may have been due to the restrictive definition of classifying HA-COVID-19 cases as patients found to be SARS-CoV-2 positive >14 days from admission, a definition initially chosen to maximize specificity for HA-COVID-19 and to exclude any potential community-acquired SARS-CoV-2 infections. A sensitivity analysis using 7, rather than 14 days, as a definition for HA-COVID-19 yielded twice the number of HA-COVID-19 cases with similar findings in HCW vaccination rates. Nevertheless, the true burden of HA-COVID-19 was likely underestimated for the following reasons: (1) HA-COVID-19 cases with shorter incubation periods would not be captured with our definition, (2) asymptomatic cases are difficult to diagnose without active surveillance, and (3) exposed inpatients may have presented with COVID-19 after discharge. Ensuring HCW vaccination against SARS-CoV-2 may reduce HA-COVID-19 and improve patient outcomes in addition to protecting the HCWs themselves against COVID-19.

Acknowledgments.

Financial support. No financial support was provided relevant to this article.

Conflicts of interest. All authors report no conflicts of interest relevant to this article.

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The effect of surgical face masks on oxygenation and respiratory rate in hospitalized patients with coronavirus disease 2019 (COVID-19)

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Coronavirus 2019 (COVID-19) continues to spread globally, particularly in low- and middle-income countries where vaccination efforts have lagged. A major priority of health systems is to minimize the risk of nosocomial spread and healthcare worker (HCW) infection. In one study, HCWs were 7 times as likely to have severe COVID-19 as those in other professions.[1] Studies have demonstrated high viral loads and active viral replication in the upper respiratory tract within the first week of illness, when patients are more likely to be hospitalized.[2] Some procedures, such as noninvasive ventilation, may generate higher aerosolization of virus.[3] The consistent and proper use of personal protective equipment (PPE), including N-95 masks, has been advocated to decrease HCW transmission, but the availability of PPE equipment may be limited, especially in low-resource settings.[4]

Wearing surgical masks decreases spread of respiratory particles and decreases severe acute respiratory coronavirus virus 2 (SARS-CoV-2) transmission.[5] Using surgical masks on hospitalized patients may provide an additional low cost and easy to implement physical barrier to minimize HCW exposure risk, but its effect on oxygenation is unclear. The literature is limited and

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Cite this article: Ibrahim H, *et al.* (2022). The effect of surgical face masks on oxygenation and respiratory rate in hospitalized patients with coronavirus disease 2019 (COVID-19). *Infection Control & Hospital Epidemiology*, 43: 525–527, https://doi.org/10.1017/ice.2021.470

https://doi.org/10.1017/ice.2021.470 Published online by Cambridge University Press

Table 1. Study Population

Participant Demographics	No. (%)
Age, median y ± SD	50 ± 10.5
Sex, no. (%)	
Men	39 (73.6)
Women	14 (26.4)
Comorbidities, no. (%)	
None	22 (41.5)
Obesity	12 (22.6)
Hypertension	13 (24.5)
Diabetes	10 (18.9)
Chronic renal disease	2 (3.8)
Chronic lung disease	3 (5.7)

Note. SD, standard deviation.

primarily involves healthy volunteers. In a study of 24 volunteers, use of a surgical mask worn over a nasal cannula was beneficial for oxygenation and possibly decreased aerosol dispersion.[6] Another study of 16 volunteers showed negligible differences in FiO_2 with a surgical mask worn above or below supplemental oxygen.[7] The purpose of this study was to assess the effect of wearing a surgical mask on respiratory status and subjective work of breathing in hospitalized patients with COVID-19, who required supplemental oxygen (6–15 L/min oxygen) through a face mask or nonrebreather mask (FM/NRB).

Methods

We conducted a prospective before-and-after study at a COVID-19–designated hospital in the United Arab Emirates from May 15, 2021, through June 30, 2021. The hospital instituted a mask mandate for HCWs and visitors but not for patients. At the time of the study, most hospitalized patients had the delta variant of the virus. Participants were nonintubated patients with COVID-19 and acute hypoxemic respiratory failure requiring oxygen supplementation. All consecutive adult patients aged 18–75 years with COVID-19 confirmed by nasopharyngeal polymerase chain reaction (PCR) were screened and considered eligible if they (1) required oxygen supplementation with face mask or nonrebreather (6–15 L/min oxygen) and (2) had a stable oxygen saturation (not requiring increasing levels of supplemental oxygen) and no increase in respiratory rate for at least 2 hours prior to participation. The main exclusion criteria were impaired consciousness or worsening respiratory status. After obtaining baseline vital signs, a surgical mask was placed on the patient above (intervention 1) and then underneath (intervention 2) the FM/NRB, by a trained physician researcher blinded to the study hypothesis. Respiratory rate and oxygen saturation and patient comfort and ease of breathing were assessed 20 minutes after each intervention. The primary outcomes were change in respiratory rate or oxygen saturation from baseline. Secondary outcomes included patient subjective comfort levels, as determined by a questionnaire, which compared comfort level and work of breathing between baseline and wearing the mask, for each intervention. Adverse events were monitored for 1 hour after the interventions. The study was approved by the Abu Dhabi Health COVID-19 Research Ethics Committee (DOH/NCVDC/2020/1051). Written informed consent was obtained from each patient.

Statistical analysis was performed using SPSS version 26 software (IBM, Armonk, NY). Mean ± standard deviation were used to summarize the distribution of variables. A paired *t* test was used to assess differences between baseline and interventions. The Shapiro-Wilk test was conducted to determine whether the data were approximately normally distributed; when they were not normally distributed, a nonparametric test was executed to confirm the result of the parametric test. Density plots were used to visualize the distribution of variables.

Results

Among 60 eligible patients, 53 agreed to participate (88% response rate). Participant demographics are listed in Table 1. Most were male (39 of 53, 73.6%) with a mean age of 50 ± 10.5 years. There was no significant change in breaths per minute (bpm) when the surgical mask was worn above the FM/NRB (24.40 ± 6.28 vs 24.92 ± 5.55; $P = .38$). Mean respiratory rate increased when the surgical mask was placed below the FM/NRB (26.85 ± 7.03; $P = .024$) (Table 2). There was a statistically significant decrease in oxygen saturation when the surgical mask was placed below the supplemental oxygen (97.51% ± 2.38% vs 95.56% ± 2.82%; $P < .001$). Most patients (39 of 53, 73.6%) reported greater subjective discomfort and dyspnea when wearing the surgical mask below the FM/NRB.

Discussion

Throughout the COVID-19 pandemic, infection and illness have posed a significant threat to HCWs. Hospitals worldwide have implemented multipronged strategies, including enhanced surveillance and outbreak management.[8] These interventions require substantial investment in terms of cost, manpower, and bed allocation,[8] and they cannot be implemented in many countries. Our study shows that hospitalized patients with acute hypoxemic respiratory failure, requiring oxygen therapy via a face mask or NRB, can safely wear a surgical mask without compromising respiratory status. This practice can serve as an additional protective measure to minimize risk of nosocomial and HCW infection. Wearing the mask below the FM/NRB caused a small but significant decrease in oxygenation and increase in respiratory rate from baseline and caused significantly more subjective discomfort. Therefore, we recommend placing the mask above the FM/NRB.

https://doi.org/10.1017/ice.2021.470 Published online by Cambridge University Press

Table 2. Oxygen Saturation, and Respiratory Rate With Surgical Mask Interventions (N = 53)

Variable	Mean ± SD	Comparison	Mean Difference (95% CI)	*P* Value
Oxygen saturation, %				
Baseline	97.02 ± 2.12	Baseline vs intervention 1	−0.49 (1.10–0.12)	.11
Intervention 1	97.51 ± 2.38	Baseline vs intervention 2	1.47 (0.71–2.22)	**<.001**
Intervention 2	95.56 ± 2.82	Intervention 1 vs intervention 2	1.96 (1.25–2.66)	**<.001**
Respiratory rate, breaths per minute				
Baseline	24.40 ± 6.28	Baseline vs intervention 1	−0.53 (−1.73 to 0.67)	.381
Intervention 1	24.92 ± 5.55	Baseline vs intervention 2	−2.45 (−4.58 to −0.33)	**.02**
Intervention 2	26.85 ± 7.03	Intervention 1 vs intervention 2	−1.92 (−3.65 to −0.20)	**.03**

Note. SD, standard deviation; Intervention 1- Surgical mask above FM/NRB; intervention 2- Surgical mask below FM/NRB.

Study limitations include single center with small sample size, primarily male participants, and limited follow-up duration. Nonetheless, our findings can help inform infection prevention measures, particularly in low-resource settings. Further studies with larger sample sizes assessing surgical mask use with different oxygen modalities and effects on aerosolization of virus particles are warranted.

Supplementary material. To view supplementary material for this article, please visit https://doi.org/10.1017/ice.2021.470

Acknowledgments.

Financial support. No financial support was received for this study.

Conflicts of interest. All authors report no conflicts of interest relevant to this article.

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Resistance of clinical and environmental *Acinetobacter baumannii* against quaternary ammonium

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The challenge in the treatment of infections associated with *Acinetobacter baumannii* is related to multidrug resistance, mainly to carbapenems (eg, carbapenem-resistant *A. baumannii* or CRAB). Quaternary ammonium compounds, such as benzalkonium chloride (BZK), are among the most used biocides and are considered a nonspecific agent.[1] Resistance to BZK develops through ribosomal protein mutations, protecting the *A. baumannii* against protein aggregation induced by the BZK,[1] or mediated by the acquisition or hyperexpression of multidrug efflux pumps, which are usually encoded by several genes located on plasmids, such as the *qac* gene.[2] In this study, we sought to determine the minimal inhibitory concentration (MIC) of the BZK in CRAB

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Cite this article: de Andrade AP, *et al.* (2022). Resistance of clinical and environmental *Acinetobacter baumannii* against quaternary ammonium. *Infection Control & Hospital Epidemiology*, 43: 527–530, https://doi.org/10.1017/ice.2021.418