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.

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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 infection. In one study, HCWs were 7 times as likely to have severe infection. In one study, HCWs were 7 times as likely to have severe infection. In one study, HCWs were 7 times as likely to have severe infection.

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

| 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.

For comparison, medical staff and HCW working primarily on COVID-19 units are included.

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. 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.

Wearing surgical masks decreases spread of respiratory particles and decreases severe acute respiratory coronavirus virus 2 (SARS-CoV-2) transmission. 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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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 FiO2 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 non-rebreather mask (FM/NRB).

**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.

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,3 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.
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

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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.