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Oxygen: under or over a surgical facemask for COVID-19 patients?

Patients usually require supplementary oxygen for a period of time in the post-anaesthesia care unit (recovery area) [1]. Patients with COVID-19 still require elective or emergency surgery and there appears to be a lower threshold for tracheal intubation in these patients [2], necessitating the use of mechanical ventilation and neuromuscular blocking drugs. It, therefore, follows that they will likely need supplementary oxygen for a period of time following tracheal extubation. A study by Hui et al. in 2006 showed that while wearing a simple facemask with an oxygen flow rate of 4 l.min^{-1}, breathing 12 breaths per minute with a tidal volume of 500 ml, an expiratory plume of potentially infectious air can be detected around the patient up to a distance of 0.4 m [3].

Covering the nose and mouth with a facemask of individuals symptomatic with COVID-19 has been recommended by several authorities, including WHO, as well as government organisations from several countries including Australia [4] and the UK. It has been shown that wearing a mask will reduce coronavirus detection in droplet and aerosol samples in symptomatic patients [5]. The recent consensus guidelines published in *Anaesthesia* recommend that patients wear a facemask in addition to their oxygen mask or nasal cannulae following tracheal extubation, where this is practicable [2].

The question has arisen in our institution as to whether the facemask should be applied over a Hudson mask, or if it should be applied underneath the Hudson mask, and if there is any difference in F_IO_2 between the two approaches. Using a carbon dioxide sampling line attached to a 16G cannula, we measured the F_IO_2 at the lips in a healthy volunteer in three situations. The first, breathing air wearing a surgical mask on the face; second, breathing 6 l.min^{-1} oxygen via a Hudson mask placed over the top of a surgical mask; and third, breathing 6 l.min^{-1} oxygen via a Hudson mask placed underneath a surgical mask. The F_IO_2 measured was 0.20, 0.50 and 0.54, respectively (Fig. 1).

Given the negligible difference in F_IO_2 when the Hudson mask is placed over a surgical mask, our COVID-19 extubation protocols now call for a surgical mask to be placed over the patient's nose and mouth immediately following extubation, and for a Hudson mask to be placed on top. This could also have implications for patients in the rest of the hospital. If a patient needs to be transported around the hospital, WHO guidelines suggest they should be wearing a surgical mask. If they also need supplementary

Figure 1 F_IO_2 shown with Hudson mask over, then under, a surgical face mask.

oxygen, these data would suggest they can wear the oxygen mask over the top of a surgical mask without compromising their F_IO_2.

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