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Protecting staff and patients during airway management in the COVID-19 pandemic: are intubation boxes safe?

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Keywords: airway management; COVID-19; infection prevention; personal protective equipment; SARS-CoV-2; tracheal intubation

Editor—We read with interest the correspondence by Cubillos and colleagues[1] and Yong and Chen.[2] Cubillos and colleagues[1] describe the design and manufacture of a ‘negative-pressure airflow isolation chamber’ to reduce the risk of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) transmission during airway management, and Yong and Chen[2] report the use of flexible plastic screens and tents for the same purpose. A number of similar reports have been published in recent literature describing the use of various ‘intubation boxes’ and drapes,[3–5] all of which aim to provide a physical barrier to aerosols and droplets. Although these innovations are doubtless well-meaning, we are concerned that any additional protection that such devices may afford is gained at the cost of increased difficulty in managing the airway.

The concept of difficult airway in the critically ill comprises anatomical, physiological, and environmental elements,[6] exacerbated in the current pandemic by human factors and the communication limitations imposed by highly restrictive personal protective equipment.[7,8] In our own anecdotal experience, coronavirus disease 2019 (COVID-19) appears to be associated with laryngeal oedema independent of that associated with prolonged tracheal intubation,[9] making airway management potentially more challenging.

We trialled the use of a rigid intubation box similar to that proposed by Canelli and colleagues[3] in a simulation setting, and found that the presence of a physical barrier increased the difficulty of tracheal intubation, especially during transition between airway devices and when using intubation adjuncts, such as the gum-elastic bougie (Fig. 1). A physical limitation in dexterity when using intubation boxes was predicted by Cubillos and colleagues[1] in their letter, and our experiences support this prediction. However, we are concerned that similar problems may be encountered with all barrier devices. We advise caution in adopting the use of any physical enclosure in practice, as existing airway devices were not designed to be used in conjunction with intubation boxes, and airway management training has hitherto not included their use. There is also the question of how and when to remove barrier enclosures that lack any mechanism for air extraction or exchange without dispersion of high concentrations of aerosolised SARS-CoV-2 virus.

Fig. 1. Use of a gum-elastic bougie and McGrath videolaryngoscope (Medtronic, Minneapolis, MN, USA) with an intubation box for simulated intubation.

Managing difficult airways in the critically ill is challenging,[6] and we believe this may be compounded by such home-made aids, however well intentioned. We must protect our staff during high-risk procedures, but not when this confers a threat to patient safety. Whilst both the safety and efficacy of barrier enclosures in airway management remain unproved, our focus should continue to be on the use of appropriate and well-fitted personal protective equipment, worn and disposed of effectively.

Declarations of interest

CS is a former member of the editorial board of *BJA Education*. The other authors declare no conflicts of interest.

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Evaluating intubation boxes for airway management

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Keywords: aerosol-generating procedures; airway management; barrier enclosure; COVID-19; SARS-CoV-2; schlieren analysis; tracheal intubation

Editor—The concept of an intubation box to contain aerosols has been proposed to address the risk of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) transmission to healthcare professionals during airway management.[1–4] This barrier enclosure method has been widely promoted in the popular media.[5,6] Although there is a need for innovation, it remains important to fully assess new concepts to ensure their fitness for purpose. To date, the intubation box has only been tested using a vertical cough model using a Simman[1] mannikin (Laerdal Medical, Stavenger, Norway). We subjected such a box to objective airflow analysis of its performance with a human volunteer (more relevant to how it would be clinically deployed). We also collated perspectives from potential users in anaesthesia.

For airflow dynamic analysis, a barrier enclosure box of similar dimension and design to that proposed was placed over the head and upper torso of a healthy volunteer laying on an operating table in our simulation theatre (see Supplementary Fig. S1).[1] Schlieren imaging (a passive imaging method for direct visualisation of refractive index changes) was performed around the box during both normal and deep exhalation and during coughing. The imaging focused on both the user side of the box (where there are two apertures for insertion of the healthcare professional's hands) and on the opposite side (which is open to allow positioning over the patient). A high-speed monochromatic camera (Phantom version 311 capable of 10,000 image s^{-1} frame rate with 1920×1080 pixel resolution; Bell Labs, Wayne, NJ, USA) was used to capture images and allow analysis. Testing was repeated three times.

This assessment showed that substantial amounts of air moved out of the box and into the operating room during coughing (Fig. 1). This could be eliminated by placing a drape over this open side of the box such that, on repeat assessment, no airflow escaped the enclosure on that side. The analysis also identified some movement of air out of the box via the