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# COVID-19 aerosol box as protection from droplet and aerosol contaminations in healthcare workers performing airway intubation: a randomised cross-over simulation study

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## ABSTRACT

**Background** Concerns over high transmission risk of SARS-CoV-2 have led to innovation and usage of an aerosol box to protect healthcare workers during airway intubation in patients with COVID-19. Its efficacy as a barrier protection in addition to the use of a standard personal protective equipment (PPE) is not fully known. We performed a simulated study to investigate the relationship between aerosol box usage during intubation and contaminations on healthcare workers pre-doffing and post-doffing of PPE.

**Methods** This was a randomised cross-over study conducted between 9 April to 5 May 2020 in the ED of University Malaya Medical Centre. Postgraduate Emergency Medicine trainees performed video laryngoscope-assisted intubation on an airway manikin with and without an aerosol box in a random order. Contamination was simulated by nebulised Glo Germ. Primary outcome was number of contaminated front and back body regions pre-doffing and post-doffing of PPE of the intubator and assistant. Secondary outcomes were intubation time, Cormack-Lehane score, number of intubation attempts and participants' feedback.

**Results** Thirty-six trainees completed the study interventions. The number of contaminated front and back body regions pre-doffing of PPE was significantly higher without the aerosol box (all p values < 0.001). However, there was no significant difference in the number of contaminations post-doffing of PPE between using and not using the aerosol box, with a median contamination of zero. Intubation time was longer with the aerosol box (42.5 s vs 35.5 s, p < 0.001). Cormack-Lehane scores were similar with and without the aerosol box. First-pass intubation success rate was 94.4% and 100% with and without the aerosol box, respectively. More participants reported reduced mobility and visibility when intubating with the aerosol box.

**Conclusions** An aerosol box may significantly reduce exposure to contaminations but with increased intubation time and reduced operator's mobility and visibility. Furthermore, the difference in degree of contamination between using and not using an aerosol box could be offset by proper doffing of PPE.

## Key messages

### What is already known about this subject

- The aerosol box was conceived during the COVID-19 pandemic to protect healthcare workers from exposure to viral contamination during aerosol generating procedures.
- Studies investigating its efficacy in reducing the amount of contaminations on healthcare workers are currently limited to small studies, or studies that measured airborne particles and not contaminations on healthcare workers.

### What this study adds

- In this randomised cross-over study simulating aerosolisation during intubation, the aerosol box reduced droplet and aerosol contaminations on healthcare intubators personal protective equipment (PPE). However, post-doffing contaminations were similarly low between aerosol box and no aerosol box usage.
- The increased intubation time and restricted movement when using the aerosol box in our study corroborate prior research.
- The aerosol box should be used with caution. Clinicians should consider patient safety risks particularly in difficult airway or severely hypoxic patients, since contamination can be mitigated by proper donning and doffing of PPE.

## BACKGROUND

Since the outbreak of the novel coronavirus disease (COVID-19) in December 2019, healthcare workers around the world have been concerned about its high risk of transmission. COVID-19, caused by SARS-CoV-2, is transmitted primarily through respiratory droplets.<sup>1</sup> Appropriate use of personal protective equipment (PPE) can significantly reduce the risk of transmission.<sup>2</sup> However, interventions such as airway intubation and mechanical ventilation can potentially generate aerosols of virus-contaminated respiratory secretions.<sup>3,4</sup> Aerosols can