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Negative airflow isolation bed provides an option for NIV ventilation during COVID -19 pandemic

We all are facing disaster with this covid pandemic and now it's acting as a real super spreader. Till writing this letter in the entire globe over 6 million people have been infected by this virus and so far, over around 4 lakh people have died due to COVID 19. As our country India is currently in coronavirus lockdown 5.0 phase. A total of 2.5 Lakh cases are detected as COVID positive and more than six thousands COVID 19 patients have succumb to death.

According to current evidence, approximately 14% of COVID-19 patients develop a severe and 5% develop a critical form of disease which requires respiratory support treatment [1]. About 67% of the critical patient develop ARDS [1]. The various non-invasive supportive treatments like oxygen therapy, HFNC (High Flow nasal Canula), CPAP and NIV (non-invasive ventilation) are always associated with high risk of aerosol dispersion, especially in unprotected environments. In fact, various aerosol-generating procedures like airway suction, bronchoscopy, endotracheal intubation, tracheostomy and cardiopulmonary resuscitation are exposing our healthcare workers at high risk of transmission [2]. The joint guidelines by the European Society of Intensive Care Medicine and the Society of Critical Care Medicine advise against the use of NIV if HFNO is not available [3]. These joint guidelines were against NIV only because of droplets or aerosol generations. As these exhaled aerosol size depends on the characteristics of the fluid, the force and pressure at the moment of emission, and environmental conditions (e.g. temperature, relative humidity and air flow). So as an alternative strategy for creating a protective environment using a mobile unit that recycles and distributes treated air and acts as mobile air decontamination unit. This unit may be safely used in performing all aerosol related procedures and also effective in providing various forms of non-invasive supportive treatments like the NIV, CPAP, HFNC and Nebulization. We are using Bed-Air System (BAS) (Bed-Air Ltd, Kemp house, UK) in our set up as it is a portable, independent patient isolation system in which the air delivery or extraction is made through the canopy support structure (Fig. 1). For air delivery a rigid plastic round airflow (PVC, medical grade) tunnel between canopy and filter unit is present and due to the presence of an airflow system. This system delivers a negative airflow of $112\text{m}^3/\text{hr}$ and provides < 1 colony forming unit/ m^3 of environment after 10 minutes of installation. This containment version removes the aerosols that are contaminated with viral or bacterial content by using a continual negative air flow and prevents the escape of air from the canopy. The BAS described by Yochai et al. [4] is very small covering only the upper part of the body and seems to create claustrophobia to awake patient

and provide difficult access for any respiratory care. However, the BAS which we have used, covers the whole body, have advantage of adjusting the height, length and direction of the filter unit along with canopy, and have capacity to accommodate the drip stand. Lucchini et al. [5] describe role of Helmet CPAP with an HEPA filter placed after the positive-end-expiratory-valve reduces COVID 19 contamination. The entire cost of this BAS setup is around 10000 dollars and this unit can be easily be setup in just one day. This Bed-Air system might provide a cost-effective protective cover to the patient of acute respiratory failure requiring management with HFNC and Mask-NIV and during aerosol generating procedure likes, airway suction, nursing care, bronchoscopy, endotracheal intubation, and other respiratory care practice.

Limitation: No study or other data exists if this system is able to reduce contamination or infection of health care providers in real clinical settings. Future studies need to show if such proposed protection systems are cost effective and able to save more lives during the COVID 19 pandemic.

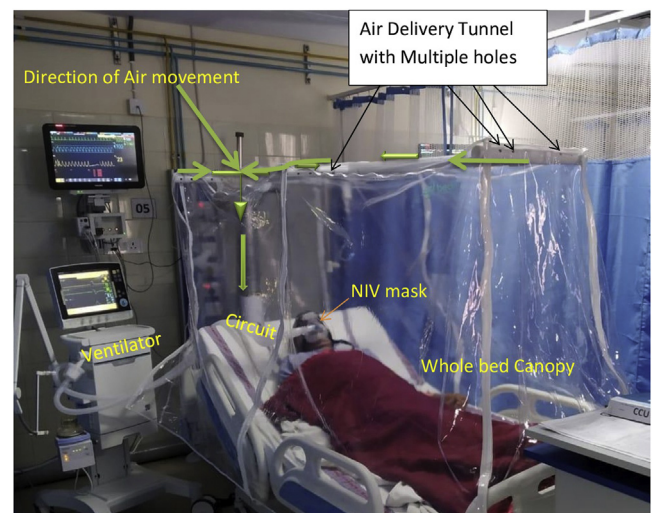


Fig. 1. Negative airflow isolation bed system with NIV ventilation in suspected COVID Patient.

Consent

Obtained from the patient relative.

Declaration of competing interest

Nil.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.tacc.2020.07.005>.

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