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ORIGINAL ARTICLE

Remodelling ICU Air Conditioning System in a Resource Constraint Setting Amid COVID19 Pandemic

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1 | INTRODUCTION

COVID-19 pandemic is a rapidly evolving public health emergency where a nation's health care system can face a marked surge in demand for ICU beds. Amidst these circumstances, preparing ICU for this potentially formidable infectious outbreak with the traditional air conditioning system might increase the risk of COVID-19 transmission among health care workers. All critically ill patients with confirmed COVID 19 infection should ideally be treated in an Airborne Infection Isolation Room (AIIR). The AIIRs are at negative pressure relative to its surrounding areas should have a minimum of 12 air changes per hour with air exhausted directly to outside, or air has to be filtered through a high-efficiency particulate air (HEPA) filter before recirculation with the doors closed at most times. (1) However, a survey of 335 ICUs conducted across 20 Asian countries showed that only 12% of ICU rooms were having AIIRs. (2) It has also been observed that the number of AIIRs is lowest among low-income countries. (3) The provision of the best possible essential services amid these circumstances would be more appropriate rather than the best clinical services. (4)

Our hospital is an apex Centre for treating the COVID19 patient in the northern part of India. In the wake of this pandemic initially, we set up a 14 bedded ICU exclusively for managing COVID-19 patients. As the facility for AIIRs or separate patient cabins is not available, considering the immediate steep rise in cases, we had neither time nor adequate finances to procure HEPA filters or build up negative pressure cabins. To convert an existing ICU into a COVID-19 unit, the first requirement is to convert the room into a non-recirculatory system by blocking the return air ducts. (5) Apart from this, an exhaust blower will act to extract the room air and exhaust it out into the atmosphere. The exhausted air quantity should be more than the inflow air quantity so that a negative pressure of a minimum 2.5Pa is achieved. Hospitals must install differential pressure meters to ensure this. The best position of the exhaust air fan

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would be just above the head of the patient's bed. We had improvised our system to ensure adequate ventilation, and safety. Certain modifications to the HVAC (Heating, Ventilation and Air Conditioning) system are advisable to introduce more fresh air with adequate elimination of re-circulated gases.

1. Block the recirculation ducts of the HVAC with airtight seal using plastic sheets and activate the smoke exhaust ventilation. (Figur.1A,C)
2. Minimize the forward flow of air in the HVAC system of the ICU, by opening the windows of the ICU and install additional exhaust fans to creative negative pressure. (Figure.1B,C)

Airflow studies must be conducted using smoke tests to ensure there is no stagnation of air. In this way, we managed to create a well-ventilated ICU with available resources. Such a model can be implemented in the resource constraint regions facing a huge influx of coronavirus cases requiring urgent setting up of ICUs.

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Legend of figure

FIGURE 1: (A) Sealing of recirculation duct, (B) Opening of windows, (C) Activation of exhaust fan

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