

Role of Noninvasive Oxygen Therapy Strategies in COVID-19 Patients: Where are We Going?

Subhal B Dixit

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Conventional oxygen therapies may be insufficient for managing hypoxemia in hospitalized patients with COVID-19. Along with appropriate antiviral and immunomodulatory therapy, supplementary oxygen therapy with either high-flow nasal cannula (HFNC), noninvasive positive-pressure ventilation (NIPPV), or intubation and invasive mechanical ventilation would be necessary depending on the severity of the disease. Currently, intensive care units (ICUs) are overwhelmed in the face of COVID-19. Noninvasive ventilatory support can be of great help to ease the pressure. However, all these therapies are associated with aerosol generation. It is critical since the World Health Organization (WHO) has recently acknowledged airborne transmission as a possible mode of transmission besides respiratory droplets and fomites (direct and indirect contact).¹

Apart from the disease severity and availability of resources, one factor in choosing a suitable oxygen therapy could be the availability of negative-pressure rooms to manage the hospitalized patients with COVID-19. In India, negative-pressure rooms are currently lacking in both government and private hospital setups. This shortcoming could also contribute to the choice of oxygen therapy.

In this issue of *IJCCM*, Subramaniam et al. report the results of an online survey wherein they explored Indian intensivists'/anesthesiologists' approach to noninvasive oxygen therapy in nonintubated ICU patients. A total of 183 responses were included in the study. Respondents from first-responder hospitals (government hospitals and medical college hospitals) were more willing to manage nonintubated hypoxemic patients in neutral-pressure rooms, while respondents from private hospitals preferred negative-pressure rooms ($p < 0.001$). Private hospital doctors were less comfortable to use any form of noninvasive oxygen therapies in neutral-pressure rooms compared to first-responder hospitals (low-flow oxygen therapy: 72% vs 50%, $p < 0.01$; HFNO: 47% vs 24%, $p < 0.01$ and NPPV: 38% vs 28%, $p = 0.20$).²

This survey was able to identify the clinicians' apprehension more so from private hospital setups than first-response hospitals for the use of noninvasive oxygen therapies (HFNO or NIPPV) in patients with COVID-19. This behavior is likely to be contributed by clinicians' hesitation to utilize neutral-pressure rooms. It was clear from the study that over 60% of respondents in the survey did not prefer a neutral-pressure room in managing the nonintubated hypoxemic COVID-19 patients. Additionally, lack of easy availability of personal protective equipment (PPE) during the initial days of the pandemic, particularly in private setups, could be a significant contributing factor for clinicians' behavior captured in this survey. With the improvement in tackling the COVID-19 crisis both in terms of easy availability of resources (PPE kits, N95 masks, etc.)

Department of Critical Care, Sanjeevan and MJM Hospital, Pune, Maharashtra, India

Corresponding Author: Subhal B Dixit, Department of Critical Care, Sanjeevan and MJM Hospital, Pune, Maharashtra, India, Phone: +91 9822050240, e-mail: subhaldixit@yahoo.com

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and clinicians' knowledge about the best practices to follow while managing patients with COVID-19, the initial reluctance among physicians may lean toward the use of noninvasive oxygen therapies in more recent times. In response to the COVID-19 crisis in India, the National Center for Disease Control (NCDC) recommended the availability of a negative-pressure environment in the hospitals/isolation centers with the use of various technologies to negate the aerosol transmission of COVID-19.³

The choice and timing of NIPPV or HFNC remain contentious in COVID-19 patients. Though recent research prefers HFNO over NIPPV, due to its low aerosol-generating capacity,⁴ the uncertain evidence along with the alleged risks of aerosol generation and delayed intubation have led to varying recommendations between authorities (Table 1).

The surviving sepsis campaign, a joint collaboration of the Society of Critical Care Medicine (SCCM) and the European Society of Intensive Care Medicine (ESICM), suggests using HFNC over conventional oxygen therapy for adults with COVID-19 and acute hypoxemic respiratory failure.⁵ The National Health Service (NHS) of the United Kingdom (UK) does not recommend HFNC usage in COVID-19 management. Noninvasive positive-pressure ventilation may be indicated as a ceiling of treatment, as a trial to avoid intubation and to facilitate extubation.⁶ The WHO guidelines call for HFNC or NIPPV to be used only in selected patients with

Table 1: Summary of recommendations from different groups

Organization	NIV	HFNO
Surviving sepsis campaign	Yes	Yes
National Health Service (UK)	Yes	No
WHO	Yes	Yes
The US Department of Defense	No	Yes
ISCCM	Yes	Yes

hypoxemic respiratory failure. High-flow nasal cannula may be safe in patients with mild-moderate and nonworsening hypercapnia. A short (~1 hour) trial may be attempted and intubation should be done in acutely deteriorating patients or in those who do not improve. Limited data suggest that NIPPV has a high failure rate in patients with viral infections.⁷ The U.S. Department of Defense (DoD) recommends HFNC if the intubation/mechanical ventilation resources are limited or unavailable. Noninvasive positive-pressure ventilation is not recommended due to the higher risk of transmission.⁸ ISCCM recommends reserving HFNC/NIPPV in COVID-19 patients with severe hypoxia. The position statement recommends that these be applied with full precautions in negative-pressure rooms.⁹

The benefits of using noninvasive oxygen strategies must be weighed against the risks of transmission to healthcare workers. Though the current study² has certain limitations as elaborated by authors, this survey is able to capture clinicians' practices with regards to use of noninvasive oxygen therapy. These outcomes would guide to address them by implementing policy measures at various levels. Resource availability at both first-responder and private hospitals needs to be addressed and negative-pressure rooms need to be made available at the earliest.

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