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LETTER TO THE EDITOR

Acute hospital oxygen shortage during COVID-19 pandemic surge: how can we prevent the apocalypse?

Dear Editor,

The 2019 novel coronavirus disease, caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), has caused not only 3 million deaths worldwide, but also crumbled the healthcare system of various countries. One such country facing this grim reality is India. Almost 15% of patients are likely to develop severe illness while 5% may develop critical disease requiring invasive mechanical ventilation.[1] Oxygen therapy is one of the few known and accepted treatments for COVID-19. Catastrophic shortage of oxygen in various parts of the world has urged us to introspect whether we are equipped enough to deal with this crisis.

Prevention of an apocalyptic disaster in the face of oxygen shortage entails measures at all levels. One important measure is augmenting oxygen production to match usage. A technical guidance by the World Health Organization (WHO) says that oxygen can be generated at Pressure Swing Adsorption (PSA) in oxygen plants and liquid oxygen plants, that can or cannot be located at a medical facility respectively. Oxygen concentrators are another portable means, which use PSA technology to draw air from the environment and remove nitrogen to deliver around 90% concentrated oxygen. They work on the principle of fractional distillation. They are safe and cost-effective but require continuous source of power. Another limitation is that the flow may be less than the requirement of the hospital.

The WHO also recommends development of an "oxygen surge plan" to ensure readiness to tackle a surge in cases. Establishment of more PSA plants in hospitals can be done. Urgent installation of oxygen concentrators with PSA technology especially in rural India may save the day and brace us for the rising COVID-19 cases. A team of doctors, biomedical engineers, and technicians should oversee the safe working of oxygen supply plants.

Another challenge is of oxygen supply that can be done by means of primary, secondary, and reserve components. Primary consists of liquid oxygen and cylinder manifold while secondary supply comprises a manual cylinder system of another vessel of liquid oxygen. Most hospitals that use a cylinder manifold as reserve need to have two storage banks of around 20 cylinders each to ensure a reserve of 4 days at least. The reserve supply means an automated cylinder manifold stored at a location different from that of the primary site.

One vital measure that we may incorporate in practice is judicious use of oxygen by meticulously defining target goals for oxygen saturation. Surviving sepsis guidelines for COVID-19 have recommended a "conservative oxygen strategy" with target oxygen saturation (Spo_2) of 92—96%. They strongly recommend against a SpO_2 of > 96%.[2] The same has been justified to avoid a scenario of depletion of oxygen resources by liberal use. We recommend that a tailored approach weighing benefits of oxygen therapy versus available resources for individual patients be utilized. Srinivasan and colleagues proposed the use of "Oxygen Extraction Ratio (O_2ER)" in conjunction with arterial blood gas and central venous oxygen ($ScVO_2$).[3] The Improving Oxygen Therapy in Acute-illness (IOTA) systematic review and meta-analysis reported a significantly high 30-day mortality in the liberal oxygen therapy group and they concluded that supplemental oxygen was no longer beneficial in patients with an SpO_2 above 94—96%.[4]

Unwarranted oxygen wastage in the form of circuit leaks must be anticipated and avoided. Nursing officers and technicians should be educated in this regard. Lastly, in the event of an unwarranted surge in COVID-19 cases, all elective procedures must be suspended. A "contingency plan" for such a crisis management must be put together by governments.[5] To conclude, these measures are indeed need of the hour to help us stay afloat in this COVID-19 tsunami.

Conflicts of interest

The authors declare no conflicts of interest.

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