



Editorial

Oxygen delivery systems and training needs in pediatric and adult settings- a call to action beyond COVID-19 era

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Oxygen was first used to manage a young patient with pneumonia in 1885, and by 1907 nasal catheter devices for oxygen delivery were introduced.^[1] Since then oxygen use, its modes of administration, best oxygen prescription practices, and interfaces for oxygen administration have continued to evolve: for example, oxygen cylinder versus piped oxygen or use of oxygen concentrators; high-flow nasal oxygen, nasal cannula, nasal prongs, nasal masks, simple face masks, rebreather/non-rebreather masks, venturi masks, masks with reservoir bag, oxygen hoods and tents, non-invasive and invasive mechanical ventilators. The way these equipment are used in pediatric and adult patients are sometimes different, such as the interfaces applicable and the rate of oxygen flow prescribed. Up to 12% of hospitalized patients may require oxygen during their admission in the hospital.^[2] Every year globally, at least 1.4 million deaths occur due to the lack of supplemental oxygen therapy and inappropriate administration of oxygen.^[3] In one study, 40.7% of patients had a prescription to target oxygen saturation SpO_2 and only 31.1% achieved their target saturation.^[4]

The COVID-19 pandemic has further brought to fore the importance of oxygen as a medication that is required when the lungs need further oxygenation support. Unfortunately, there are yawning gaps in the knowledge base and appropriate practice with regard to oxygen use. These gaps exist in pediatric practice as well as in adult settings.

It is imperative that anyone involved in the administration of oxygen must understand that it is a medication and therefore be aware of the potential hazards and side effects of oxygen as a medication. Oxygen overuse and toxicity can occur with untoward consequences. Central nervous system oxygen toxicity, for example, can cause seizures and unconsciousness. Pulmonary oxygen toxicity can damage the lungs, causing pain and difficulty in breathing.^[5,6] The toxic effects from oxygen therapy can occur based on the condition of the patient and the duration and intensity of the oxygen therapy. Thus, high concentrations of oxygen need to be closely monitored with formal assessments using pulse oximetry and arterial blood gas measurements. For patients with CO_2 retention, the overuse of oxygen can attenuate the hypoxic drive with serious consequences. Thus, there is the need to ensure adequate knowledge of appropriate oxygen use, as oxygen should be administered cautiously and according to the various safety guidelines.^[5]

Appropriate oxygen delivery will further involve assessment of oxygen needs and the specific indication for oxygen, understanding the pathophysiology for which oxygen is indicated, and the appropriate prescription and the suitable interface required to achieve a targeted SpO_2 . These also depend on the local availability of required equipment or interface that is best suited to manage that adult or pediatric patient. Even when oxygen is indicated knowledge of the appropriate

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target SpO₂ is needed to avoid life-threatening hypercapnia in patients with type 2 respiratory failure and poor outcomes associated with hypoxemia.^[7,8]

Lack of training was given as the main reason why 63% of practicing clinicians in Africa, Asia, and South America and such resource-limited settings fail to use oxygen supplementation appropriately.^[9] Furthermore, many healthcare workers who are involved daily with oxygen administration may not be aware of the existence of international oxygen therapy guidelines such as that issued by the WHO and British Thoracic Society and many other respiratory societies.^[5,10-12] Countries such as Nigeria have a document on National Policy on Medical Oxygen in Health Facilities,^[13] but the reality is that many Nigerian health workers are neither aware of nor have read this document.

During this era of COVID-19 pandemic when the demand for oxygen has become critical, the appropriate practice for oxygen administration must be encouraged by all means possible. In a study in Uganda^[14] it was noted that the pre-service training curricula included a wide scope of respiratory diseases, but the actual training had not sufficiently prepared health workers to manage respiratory diseases when the need arose. With oxygen delivery practice in mind, it is noteworthy that since the COVID-19 pandemic may be here with us for a long time, the need to ensure that undergraduate/postgraduate curriculum incorporates oxygen therapy is compelling.^[15]

In a study in Ethiopia,^[16] only one-third of the health-workers had a good practice on supplemental oxygen administration and these ones were 12-times likely to have better oxygen therapy practice. In studies in Egypt and Nigeria lack of appropriate training on oxygen therapy had also been pinpointed to affect appropriate oxygen prescription and delivery.^[17-19]

Training and re-training on several aspects of respiratory health including oxygen appropriate administration can and should be organized regularly by appropriate bodies such as those organized by the Little Lung Africa in Enugu Nigeria and Breathe Africa in South Africa.^[20] These few external trainings are however nearly not enough.

A study in this current issue of JPATs highlights an important survey done in Southwest Nigeria, assessing the level of knowledge and practice of oxygen therapy among doctors and nurses.^[21] The authors found a disparity between knowledge of oxygen therapy and the level of practice of oxygen use. They recommended regular training of healthcare workers that should impact on both knowledge and practice of oxygen therapy.

It is important to mention however that in Africa, there are real issues with the availability, affordability, and sustainability of oxygen therapy. Even before the era of the COVID-19

pandemic, there was already documented evidence of oxygen shortage in Sub-Saharan Africa.^[6,22-24] which scarcity then became worse with the pandemic. Currently, oxygen concentrators may be the cheapest and most scalable way to supply oxygen, however, reliable power source and affordability of supporting equipment remains a huge problem for many African countries.^[6]

While maintaining international standards as much as possible, local hospitals, respiratory units, and respiratory societies in various countries must rise to the occasion to re-adapt international oxygen therapy guidelines to fit into what is available to them, and then to make printed protocols that guides oxygen delivery for the various age groups. These must be within reach of health workers in the emergency and respiratory firms for quick reference, so as to guide the physicians and nursing staff on how much oxygen to give and when to switch to a different delivery system. The various respiratory societies must also make it a point of duty to be the custodian of regular respiratory-related refresher update courses for healthcare professionals, which help to ensure that these gaps are further reduced. This is imperative within and beyond the pandemic era.

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