

CORRESPONDENCE

Helping Africa to breathe when COVID-19 strikes

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Dear Editor,

I read with great interest the recent debate on COVID-19 in the *Journal*.¹ Initial data indicate that about 80% of patients with COVID-19 have asymptomatic or mild disease and will recover, 15% develop severe disease, including pneumonia, and 5% become critically ill with respiratory failure, septic shock and/or multi-organ system failure.^{2,3} For these severe cases, and in particular, for the 5% who become critically ill, management in a high-dependence unit or intensive care unit (ICU) is required.

Intermittent positive pressure ventilation (IPPV) is the last resort to manage pneumonia caused by the infection. Prolonged manual IPPV with a bellows or bag is possible, as in the 1952 polio epidemic,⁴ or for short periods (e.g., during resuscitation), but for the level of sustained care expected in the West, mechanical IPPV with a ventilator is necessary.

The European average of 10–15 ventilators per 100,000 population has been shown to be wholly inadequate in an epidemic of respiratory failure caused by COVID-19. Worldwide, tens of thousands of new machines are being sought.

However, due to cost considerations, most African ICUs will not have equipment built to Western standards, including a working ventilator for every bed or compressed oxygen to operate it. The state of ICUs in Africa is complex and variable,

with differences between the public and private sector. An ICU may have a nominal machine, but it may not work when needed. Figures for ventilators in perfect working order are not available, but estimates by colleagues (with figures expressed as per 100,000 population) are as follows: 0.3 in Malawi (ICU ventilators and anaesthesia machines); 0.15 in Nigeria (ICU only); 0.23 in Uganda (ICU only); and 0.6 in Namibia (ICU only). At the time of writing, countries such as Namibia, which is reliant on imports, have run out of oxygen, either to operate these ventilators or for patient therapy.

Production of modern gas-powered electronic machines is limited, with few manufacturers. The mega-hospitals (see Figure) planned to help deal with COVID-19 in the United Kingdom will use this type, each served by a central pressurised pipeline system. This is cheaper to make than units with an independent power source (but extra cost comes with fitting and maintaining the pipeline).

African countries have few such facilities, and yet are totally dependent on the same small number of suppliers. However, in a mass ventilation scenario conducted outside the conventional ICU, the ventilators produced by these companies will be useless, even if orders from Africa were executed. Anaesthetic machines with ventilators can also be used in ICU. In Africa, where an ICU may have no ventilators, anaesthetic machines may be wheeled out of theatre with the dependent patient. However, conventional machines still require compressed gas.

To overcome these issues we need to consider alternative solutions. In Malawi 20 years ago, we developed and trialled a different breathing system called low pressure, demand flow (LPDF). In demand flow, there is no requirement for a pipeline: an inlet open to the atmosphere allows air to be supplemented with oxygen from any source, e.g., an oxygen concentrator. An electric/battery back-up power source is needed. Two small UK manufacturers (OES-Medical, Witney, UK; Diamedica Ltd, Barnstaple, UK) make LPDF systems. Similar non-gas dependent ventilator anaesthetic machine, intended for low-income countries, could also be used. Separate, non-gas dependent, ICU ventilators also exist, but they are expensive. The Malawi system was made in 2010, initially intended as a subsidised health initiative providing low-cost machines. Unfortunately, commercialisation of the project took over and the cost has risen prohibitively.

Is there a solution? In Africa, a catastrophic gap between supply and demand for such equipment will likely eclipse anything seen to date in China, Europe or the

United States. Following a meeting in New York in 2009,⁵ ‘The Giving Pledge’ was born and with it, The Global Fund. The Good Club pledgers, together with sovereign wealth funds, constitute a vast resource of wealth that could be used to buy suitable ventilators at factory cost price and donate these through existing distributor networks to facilities where they can be used. The purpose would be to remedy a dire situation affecting a new and unexpected class in need: the poor who cannot breathe.

References

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FIGURE LEGEND

Figure Facilities such as this example in the UK for mass ventilation are not realistic for most of Africa.



Figure

