

‘Bag valve masks’ pitched as alternatives to ventilators



Sample of a bag valve mask.

IIT-Hyderabad scientists say the low-cost devices need to be manufactured on a war footing under the monitoring of a government task force.

B.S. Murty, Director of the Indian Institute of Technology – Hyderabad, has urged the government to consider the use of ‘bag valve masks’ as an alternative to meet any surge in demand for ventilators, in the wake of the coronavirus (COVID-19) pandemic.

Conventional ventilators are generally expensive, hard to produce and not portable, Prof. Murty said. He, along with V. Eswaran, Department of Mechanical and Aerospace Engineering, IIT-H, explained that ‘bag valve masks’ were small devices used to deliver breathing support in emergency situations. They are also known as “ambu bags”.

The scientists said that ‘bag valve masks’ are currently hand-powered and therefore not suitable for continuous use as a ventilator. But, they posited, this could easily be remedied by designing similar devices powered by an electrical source, which could be a car battery or conventional power supply. The devices would be made portable, and therefore easy to use in villages and other areas without power supply and could be manufactured in bulk quite inexpensively.

“Our estimate is that it can be made for less than ₹5,000, or one-hundredth of the cost of a conventional machine. The cost is so low that it can be considered a single-use device that will be given over to a single patient, and never used again. It needs to be manufactured, however, on an industrial scale, in millions, within a short time of a few months. There have been several designs proposed within India itself, with IIT-H having at least one proposed design,” Prof. Murty said.

The scientists said the idea was not new. In the past few weeks, many countries have come up with the idea of manufacturing low-cost ventilators and have even initiated competitions where

the winning design would be declared open-source, which are not patented, and can be given free for anyone to adopt. Several designs are already available for 3-D printing, and so can be manufactured on a small scale on a 3-D printer.

The scientists added a note of caution that some designs were untested and uncertified. They proposed that the government (through the Department of Science and Technology or the Defence Research and Development Organisation or any other nodal organisation) constitute a task force, to oversee the production of low-costs devices within a limited time. The production rate would need to be of several lakh units per week, so the preparation has to be done at a war-footing, under the scrutiny of the government.



Prof. B.S. Murty.

High demand

The Indian industry has a maximum manufacturing capacity of approximately 6,000 units per month, but even the Indian-made devices use a lot of foreign-made parts whose availability would now be uncertain, when every country would be maximizing their own ventilator production.

A ventilator is a device designed to force breathable air into the lungs of patients who are unable to breathe for themselves.

Modern ventilators are expensive and sophisticated devices, which are generally found only in the ICUs (intensive care units) of large hospitals.

The most sophisticated computer-controlled ventilators cost around ₹40 lakh while more modest ones cost around ₹15 lakh (made abroad) and Indian-made ventilators cost around ₹6 lakh each.

The IIT scientists said that assuming a low 6% infection rate, 80 million people could get affected in India. Of these 80 million, at least 5% (4 million patients) would require ventilators. Each of these 4 million patients would need the ventilators for around 21 days, thereby blocking that machine for at least that amount of time.

Further, the machines are not portable and are found only in high-end hospitals in large cities, so patients from villages would need to be transported to these cities, which would be a logistics

problem of unimaginable complexity. Even if the Indian industry was at peak production of ventilators, it could manufacture only another 60,000 machines in the next 10 months, at a cost of ₹3,600 crore, the scientists estimate.

Therefore, the total number of ventilators would barely be 1 lakh devices — at a time when millions of machines may be needed. “We cannot depend of the conventional ventilators for a solution to this crisis,” Prof. Eswaran said..

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