

Solutions to Covid-19 Pandemic by Biomedical Engineers

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1 INTRODUCTION

Biomedical engineering is a huge topic nowadays – especially with COVID-19 circulating the globe. Biomedical engineering (often known as ‘medical engineering’) is the term used for the combination of biology and engineering or applying engineering materials to medicine and healthcare. Biomedical engineering is very important for the healthcare industry – from advancing medical treatments to monitoring a condition – without it the healthcare industry would be very unreliable.

Advancements in medical technology have improved the quality of patient care for coronavirus patients. To use these technologies effectively, hospitals and treatment facilities need qualified biomedical engineers. These devices have a direct impact on the survival rate of critical coronavirus cases. Any miscalibration while using such equipment can hamper the health of patients and even lead to fatalities. Hence, the need for biomedical engineers is certainly critical and evident at this juncture of the global health crisis.

2 Solutions provided by biomedical Engineers

2.1 More efficient Ventilators

Patients who cannot breathe spontaneously need to be put on a ventilator. Ventilators are capable of replacing the breath function and patients in an advanced state of respiratory distress are usually intubated and sedated at the beginning of the treatment. Ventilators are capable of replacing the



Figure 1: A Person on Ventilator

breath function and patients in an advanced state of respiratory distress

are usually intubated and sedated at the beginning of the treatment. They are complex systems providing the healthcare professionals with a lot of flexibility to adapt the assisted breathing settings and to be able to wean recovering patients off the ventilator gradually.

During this pandemic many young professionals design ventilators to serve more than one persons at a time thus decreasing the load on the healthcare infrastructure. Also ventilators were modified to occupy less space without decreasing the efficiency.

2.2 Oxygen Concentrators

The first form for mild respiratory insufficiency is usually the supply of extra oxygen through a nasal cannula or a more intrusive face mask. Most of the time, the oxygen comes in the form of cylinders, either small for portability or large for stationary patients and longer-term supply.



Figure 2: An oxygen Concentrator

Oxygen concentrators represent an attractive alternative to tanks although this is not typically in use while caring for COVID-19 patients in hospital settings. Oxygen concentrators extract oxygen from the air on demand and supply it directly to the patient. During pandemic it was used by patients in home isolation and served at times of medical emergencies.

2.3 Patient Monitoring Instruments

A pandemic like the one we are facing today requires constant monitoring of the vital parameters of the patient. This was a main problem faced by the medical professionals and the patients in home isolation due to acute lack of monitoring devices and high cost. One of the key parameters for COVID-



Figure 3: A Commercial Oxymeter

19 patient is the amount of oxygen in their bloodstream (SpO_2), measured by pulse oximetry which uses optics within a finger clamp. Pulse oximetry tends to be used for the duration of the patient's stay in ICU. Nowadays many apps have been developed to measure SpO_2 concentrations, and other important parameters using algorithms that use flash lights of the mobile phones to check for the changes in blood oxygen level and give the result accordingly with at most accuracy.

2.4 Rapid Covid test Kits

We all know the most efficient method to counter the covid pandemic is following the principle of 3T's i.e. test, track and treat but the time that the traditional method takes to give the result is comparatively more than what is required to be efficient.

Here, comes the role of rapid testing kits and home testing kits. They not only give the reliable result but also help in finding the result within minutes. This has added to the ability of the nations to counter the pandemic efficiently. This is one of the most important solutions by biomedical



Figure 4: A Self Covid Testing Kit

engineers. It has added to the pace of implementing 3T's formula.

2.5 Protection Equipments

At the onset of the pandemic, one of the main problem was the lack of protection equipments for the corona warriors and the safety devices for the people of the nations. Most if the equipments were needed to be imported from abroad. Then the indian biomedical engineers came into action and designed the protection equipments according to need of medical professionals and for the citizens.

Recent advances in these included face mask by engineers at MIT and Harvard University that can diagnose the person wearing the mask with Covid-19 within about 90 minutes. It is embedded with tiny disposable sensors that can be fitted into other face mask and could also be adapted to detect other virus. Similar initiative were taken by many Indian technological institutes too.

3 Conclusion

In the post-coronavirus era, medical and technological colleges across the country would be encouraging students to specialize in biomedical engineering. Such pandemics are likely to revisit us from time to time, which is why biomedical engineers have the opportunities to grow their careers and overcome these challenges. Despite being the hidden heroes,

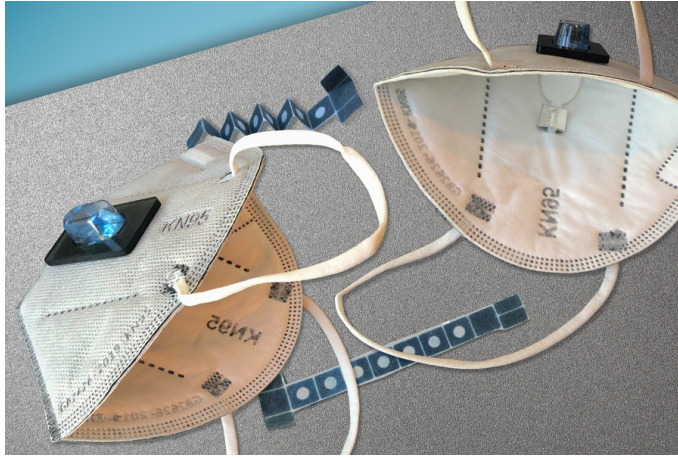


Figure 5: Mask designed by MIT and Harvard Engineers

biomedical engineers would always be appreciated by billions of Indians for
being of greater service to mankind.

THANK YOU !
