

# NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR



## BIOMEDICAL ENGINEERING

### ASSIGNMENT

# **Solutions to Covid-19 Provided By Biomedical Engineers**

*Submitted By:*

Name : Chid Prakash Dubey

Roll No. : 21111016

Semester : First

Branch - Biomedical

Engineering

*Under The Supervision Of:*

Dr. Saurabh Gupta

Department Of Biomedical

Engineering

NIT Raipur

# SOLUTION TO COVID-19 PROVIDED BY BIOMEDICAL ENGINEER

March 4, 2022

## **1 ABSTRACT**

Biomedical science and engineering have been presented as possible areas to serve medical science to combat SARS-CoV-2, due to the unique challenges reported by epidemiologists, immunologists, and medical doctors, including survival, symptoms, protein surface composition, and infection mechanisms [1,3,4,10]. These multidisciplinary engineering concepts are applied to design and develop prevention methods, diagnostics, monitoring, and therapies.

## **2 INTRODUCTION**

Biomedical science and engineering have been presented as possible areas to serve medical science to combat SARS-CoV-2, due to the unique challenges reported by epidemiologists, immunologists, and medical doctors, including survival, symptoms, protein surface composition, and infection mechanisms [1,3,4,10]. These multidisciplinary engineering concepts are applied to design and develop prevention methods, diagnostics, monitoring, and therapies.

## **3 SOLUTIONS TO COVID-19 PROVIDED BY BIOMEDICAL ENGINEER**

### **3.1 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 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.

### **3.2 PATIENT MONITERING**

An essential element of the ICU equipment is the monitoring equipment that keeps track of some of the patient vitals especially when they are ventilated and sedated but also during their recovery phase to ensure the regime of ventilation is optimised for their condition. Ventilators already provide their set of patient parameters, but usually patient monitors are separate devices as they continue to be useful after the patient can resume breathing on their own unassisted. One of the key parameters for COVID-19 patient is the amount of oxygen in their bloodstream (SpO<sub>2</sub>), 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.

### **3.3 OXYGEN CYLINDER**

Compacted oxygen and clinical air chambers are refillable containers that store oxygen and clinical gases at high gaseous pressure in a non-fluid state. They have a valve and an oxygen level controller, like a simple knob that increases or decreases the oxygen flow accordingly. These cylinders are available from small mobile units to bigger 10L containers as per the requirement. The cylinders are available in standard sizes and have controllers and fittings as per global standards.

### **3.4 INCENTIVE SPIROMETER**

You breathe in air through a tube connected to a wide air column containing a piston or ball when using an incentive spirometer. The piston or ball inside the column expands as you breathe in. The height of the piston or ball indicates the amount of air you inhaled. When you take a deep breath in for this exercise, you can feel dizzy. Stop exercising and relax if you feel dizzy or like you are about to pass out. At first, you would only be able to lift the piston or ball a few inches up the shaft.