SimplyVent: A Low-Cost Mechanical Ventilator

Salasidis, Kayla (School: Herzliah High School)

Purpose: During the COVID-19 pandemic, there was a fear of a global ventilator shortage for treating patients. This prompted the development of low-cost ventilator designs worldwide. SimplyVent is an innovative, low-cost design that can acquire all essential features and modes of a commercial ventilator whilst remaining accessible in times of crisis. Procedure: A prototype was built with readily available components and includes a novel valve control mechanism using stepper motors, an underwater pressure regulator and flow/oxygen sensors. The SimplyVent prototype was designed to be built in three stages, the first two having been completed: Stage one includes the bare minimum ventilator-controlled modes. Stage two involves the addition of sensors to measure applied flows and volumes. In the future, stage three will incorporate patient-controlled ventilatory modes using the sensors of stage two. Results: The current design has been tested on an artificial lung. The prototype works with no noted errors for hours on end. SimplyVent is ready for field testing at this stage. Conclusion: SimplyVent can support respiratory-compromised patients at 50-150 times lower-cost than a commercial ventilator. The highly configurable design is built with simple materials, accessible at any hardware and electronics store, and can be rapidly constructed and deployed in case of large-scale emergencies. The current prototype can be modified for future expansion to include all essential features and modes of a commercial ventilator. In addition, it can be used in a research environment or as a starting platform for biomedical engineering students who wish to modify the design to develop their own prototypes.

Awards Won:

University of Texas at Dallas: Back-up scholarship recipients