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Singapore clinicians develop innovative ventilator for COVID-19 patients

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Innovative "SG-Inspire" ventilator prototype is designed and custom-built by SingHealth clinician innovators and engineers for remote monitoring and is estimated to be available at a cost about five times less than that of conventional ventilators



Singapore's Clinician innovators from SingHealth hospitals viz., KK Women's and Children's Hospital (KKH), Singapore General Hospital, Changi General Hospital and Sengkang General Hospital, in collaboration with clinical innovation engineers from the SingHealth Medical Technology Office (MTO) and industry collaborators, have developed an innovative ventilator prototype for patients requiring breathing support due to the COVID-19 infection.

The locally-designed ventilator, SG-Inspire (**S**in**G**apore **I**nvasive/**n**on-invasive **s**u**p**port for effec**t**ive **re**spiration), was developed to supplement the supply of ventilators in Singapore should the need arise. Designed using readily available components with short production lead time, SG-Inspire can be scaled up and mass produced swiftly as and when needed, at a cost that is about five times less than that of conventional ventilators. It can also serve as a resource for regions that are less equipped to handle the pandemic.

SG-Inspire is designed and custom-built by clinician innovators and clinical innovation engineers who understand local and regional clinical needs, and are familiar with the operational considerations of COVID-19 care. It can facilitate respiratory support through invasive and non-invasive ventilation methods, where breathing support can be delivered using intubation or a mask interface respectively.

SG-Inspire is designed with a user-friendly interface and has in-built sensors and control software to provide assisted breathing support triggered by each patient's medical needs. It also has the following unique features that are not found in conventional ventilators:

- It uses ambient air with the option of adding low-pressure instead of high-pressure medical gas, which may be in short supply during a pandemic or in regions with limited healthcare resources.

- It can be operated remotely, reducing the need for healthcare professionals to enter the patient's room and mitigating risks of viral transmission. One healthcare professional can also monitor and control multiple ventilators.

The development of SG-Inspire began in March 2020. It has undergone rigorous tests in accordance with applicable ISO standards to validate its performance, and will undergo further tests in SingHealth institutions, starting with KKH and National Heart Centre Singapore, before being made available for clinical use.

Associate Professor Derrick Chan, Director of the KK Research Centre, KKH, and Deputy Director, SingHealth MTO, who led in the innovation said, "The development of SG-Inspire aims to supplement the supply of conventional ventilators to meet the challenges of securing ventilators supply and the need for trained healthcare professionals to manage the large volume of patients on ventilators. SG-Inspire is cost-effective and has more user-friendly features compared to conventional ventilators, which allows healthcare professionals, even those in resource-limited settings, to operate with ease."

The team behind SG-Inspire comprises SingHealth clinicians specializing in adult and paediatric intensive care and respiratory medicine, as well as clinical innovation engineers from SingHealth MTO and industry collaborators, Trilogy Technologies Pte Ltd, Vixel Inc Pte Ltd, and Akribis Systems Pte Ltd.

Development cost for the project was under S$200,000 with funding from the KKH Innovation Development Fund, SingHealth Duke-NUS Academic Medicine Special Request for Urgent COVID Research Funding, and SingHealth Duke-NUS COVID-19 Innovation Grant. Additional in-kind support and specialized technical assistance have been given for oxygen testing by Singapore Airlines and sensor technology by IFM Electronic Pte Ltd.