

Story of Young Innovators in Health Sciences



Semi-automated, mobile chest physiotherapy and prolong cardiopulmonary resuscitation machine which can be operated by a single person from a mobile application

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Overview: Chest physiotherapy (CPT) is a technique used to mobilize or lose secretions in the respiratory tract. It is required to deliver the different modes of CPT to different parts of the chest in different postures to drain the accumulated secretions. In COVID-19 complications and ICU-bound patients require CPT as a part of holistic care treatment. Also providing prolong cardiopulmonary resuscitation (CPR) is a challenging and exhausting process. There is a risk of cross infections not only by COVID-19 but also from any other communicable respiratory tract infections when conducting aerosol-generating procedures like CPT/CPR. Wearing personal protective equipment (PPE) and delivering CPT/CPR is a challenging task. It is difficult and exhausting for the healthcare worker to provide CPT/CPR by wearing PPE in a COVID-19 situation and there would be a reduction in the efficacy of the procedure. It applies to the “micro-hospital” concept also which will be the trend in the future.

Objective: To deliver chest physiotherapy and prolong cardiopulmonary resuscitation remotely and control using mobile applications.

Method: This machine is a computer numerical control (CNC) system with a vibrator. This vibrator can be moved X, Y, and Z-axis on the machine and able to deliver targeted chest percussions in preplanned or the customized pattern. The height of the machine is adjustable according to the height of the bed. This invention is composed of infrared sensors to detect the depth of the percussion and chest dimensions. The machine is fully operated by a mobile application. Therefore, healthcare providers do not need to go and have close contact with the patient when delivering the CPT or CPR. The video camera system and the two-way audio system help live monitoring and direct communication with the patient. The sensors help to determine the boundaries of the chest wall and decide the pathway of the CPT and the exact location to deliver chest compression in CPR. Considering the safety of the patient a handheld emergency stop button is available to stop the machine if the patient feels uncomfortable. The

machine has been trialed twice at Colombo South Teaching Hospital and undergoing further modifications.

Conclusions: Remotely controlled chest physiotherapy and prolonged cardiopulmonary resuscitation is a good practical approach for providing treatment in highly infectious and contagious infection bearing patients while maintaining a safe distance. Prolonged cardiopulmonary resuscitation with successful outcomes have been reported in literature. The decision to continue or stop CPR should not be based solely on the duration of resuscitation. This machine could provide CPR without any interruption while allowing the healthcare providers to observe signs of life.

Practical implications: This mobile unit can be carried within the hospital or used inward/ICU and is compatible for micro-hospitals to deliver percussion component in chest physiotherapy as a mode of telemedicine. Also, this mobile unit is helpful to use in home-based palliative care treatments as well. The medical staff can directly observe the patient and control the machine via internet. It only needs a caregiver to position machine over the patient’s bed.

Novelty: There are machines developed to provide the vibration component of the CPT. This machine addresses the percussion component of the CPT. The novelty of this machine is, it’s a fully distantly operated machine. The two way communication system and the video technology helps to observe real time and communicate with the patient.

The benefit to the society: In the future, health administration policies will develop towards the micro-hospital concept. In a micro-hospital, these machines are very useful to deliver the treatment and facilitate the practice of telemedicine treatment options.

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