



Short Communication

Benefits of wireless technology in mechanically-ventilation to navigate through the COVID-19 crisis

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Abstract

With COVID-19 cases rising quickly at alarming rates across the U.S. and globally, the pandemic crisis has exposed the importance and accelerated the need for wireless telecommunication technology in the intensive care unit. Many of these critically ill COVID-19 patients in the ICU require mechanical ventilation. Moreover, due to their underlying diagnosis, these patients are required to be in isolated rooms and under contact precautions. Often times, immediate and emergency access to the mechanical ventilator are delayed or stalled by the hurdle to properly gown up with personal protective equipment before entering the room.

Wireless telecommunication to access and control ventilator settings promptly from outside the isolation room, for example from a laptop computer, would overcome this barrier and time obstacle. Additionally, will save the already limited equipment and save money. Thus, the development of such technology is quite urgent as more and more critically ill COVID-19 patients are ending up on mechanical ventilation.

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The first wireless communication occurred in 1880. A telephone called a photophone invented by Alexander Graham Bell and Charles Sumner sent audio signals over a beam of light. Decades later, the wireless communication principles of the photophone were eventually applied to military applications and development of fiberoptic technology. It was not until the 1990s, however, that the digital wireless revolution really took hold with the advent of mobile cellphones, pagers, computer networks, wireless internet, Bluetooth wireless technology, etc.

It is hard to imagine in the world we live today how wireless communication has not influenced society in some form or fashion.

Wireless innovations have long been in use in medicine to remotely monitor patients. For example, smart devices with tiny sensors designed into microchips can track medical conditions such as irregular sleeping patterns, heart rate, and glucose levels. These computer devices serve a critical and important role in the medical and healthcare setting.

With COVID-19 cases rising quickly at alarming rates across the U.S. and globally, the pandemic crisis has exposed the importance and accelerated the need for wireless telecommunication technology in the intensive care unit. Many of these critically ill COVID-19 patients in the ICU require mechanical ventilation. Moreover, due to their underlying diagnosis, these patients are required to be in isolated rooms and under contact precautions. Often times, immediate and emergency access to the mechanical ventilator are delayed or stalled by the hurdle to properly gown up with PPEs before entering the room. Wireless telecommunication to access and control ventilator settings promptly from outside the isolation room, for example from a laptop, would overcome this barrier and time obstacle. Thus, the development of such technology is quite urgent as more and more critically ill COVID-19 patients are ending up on mechanical ventilation.

Wireless telecommunication technology in mechanical ventilation offers a variety of benefits that will improve patient care and outcomes while safeguarding the health and safety of those who care for these patients. Some of the benefits include:

- By allowing staff to remotely control ventilators from outside the closed isolation room, the respiratory clinician in charge of maintaining adequate function of the

ventilator equipment will limit themselves to exposure of the infectious disease. Thus, in so doing, reducing the risk of potential infection, calling out sick from work, and compromising staffing levels.

- With real-time diagnostics monitoring coupled with instant telecommunication access to ventilators, critical ventilator setting changes via a computer device controller outside the isolation room could be made remotely and instantaneously. If a patient's condition starts deteriorating necessitating immediate action to avert an impending crisis, ventilator settings could be adjusted quickly without having to be delayed or stalled by donning personal protective equipment (such as contact isolation gowns, face shields, face mask, gloves, etc.). This procedure can take valuable minutes to perform. Those ventilator setting changes can be remotely controlled outside of the room preventing the patient from deteriorating before the respiratory clinician finally arrives.
- As the duty of a respiratory clinician is to monitor and adjust ventilator settings to meet the patient's needs, every encounter with an infectious patient multiplies the risk of exposure to the pathogen or virus. To mitigate the risk, respiratory clinicians are required to wear personal protective equipment (PPE). Because patient visits into the isolation room necessitates the use of PPEs, the more visits into the patient's room to make ventilator setting changes, the more PPEs are used. At a time when PPEs nationally and globally are in limited supplies, utilizing wireless remote telecommunication technology to control ventilators from outside the isolation room will help to save the limited supplies of PPEs on hand.
- Donning and doffing personal protective equipment (PPE) requires a lot of time. To rush this most important task and forget a piece of equipment could be detrimental to the healthcare worker and lead to exposure to the virus. Moreover, if the clinician is caring for several mechanically ventilated

patients, the time consumed performing this procedure for each patient would amount to a substantial amount of time spent donning and doffing. This precious time could be used more effectively to perform other patient care procedures if wireless mechanical ventilation telecommunication is available.

- As wireless technology continues to improve and data acquisition gets speedier, sophisticated microchip sensors and software would be able to recognize emergency trends and events more swiftly and accurately, thus, triggering warning alerts sooner for immediate attention.

The current COVID-19 pandemic crisis has upended many of the hospital protocols that we have come to accept as common practices. It has forced us to overhaul procedures in the face of this infectious pathogen. Although respiratory therapists have continued to be diligent about correctly gowning up with PPEs, the current circumstances require us to rethink this practice. The stark reality is that COVID-19 is a highly infectious disease, overwhelming hospital systems and resources like never before. The way we do things to mitigate catching this infectious disease as healthcare workers and improve patient outcomes is to evolve and look for opportunities that will help clinicians like respiratory therapist to exploit technologies as soon as they are available. Doing so will help us to safely navigate through this crisis as best we can while improving patient care outcomes.

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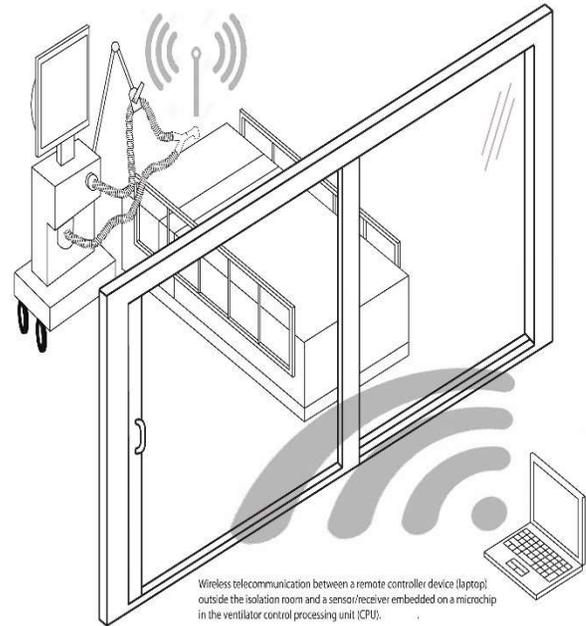


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