



Real-Time Smart Patient Monitoring and Assessment Amid COVID-19 Pandemic – an Alternative Approach to Remote Monitoring

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Sir,

The largest-ever COVID-19 outbreak is ravaging the world. This highly transmissible viral infection has led to thousands of confirmed, probable, or suspected cases in India so far, increasing burden on the health care system. Despite no proven COVID-19 specific medical therapy, with basic monitoring and supportive treatment, many of the infected patients do not need to die. COVID-19 represents an illness ready for a paradigm shift in the health care delivery and outcome, challenging the intensivists to ensure it happened. Tele-ICU technology with remote consultation is seen as a way to help hospitals cope with fewer intensivists and staff. This technology contributes to a 15–60% reduction in mortality and a 30% reduction in the average length of stay [1, 2]. Tele-ICU appears to be a promising path in the present era, but its adoption requires a huge capital investment which hinders its implementation. An estimation of \$ 2–5 million is probably the cost to set up a command centre and install the tele-ICU systems, with an operating cost of \$600,000–1.5 million per year is reported from different adaptors [3].

Facing the daunting outlook of COVID-19 pandemic surge, with limited ICU beds, resources and health care personnel, it is imperative to safely monitor and care for sickest patients. Impending crisis are opportunities for innovation, wherein a normally slow-moving healthcare system can be improvised and innovated in response to the pandemic. Utilization of remote technology to manage a deluge of critically ill COVID-19 patients may ease the burden on health care facilities and can stem the exposure of health care providers to COVID-19. But its use must be tempered with a focus on data privacy and cybersecurity. Providing better patient care services round the clock is of utmost importance. We implemented a technology for remote monitoring of ICU, utilizing closed-circuit television (CCTV) cameras and smartphones. High definition CCTV cameras were installed over each ICU bed for visualising patient mechanical ventilation and monitoring system round the clock (Fig. 1b). We have reported a similar CCTV system with audio-visual communication in the doffing area to enhance staff safety, monitored from remote location [4]. In addition to this, we installed a remote mobile health monitoring system and server structure, where patient vital parameters such as temperature, SpO₂, ECG, heart rate, blood pressure, etCO₂ and respiratory rate can be visualized over smartphone from the off-site location (Fig. 1a). It assists the skilled intensivist to monitor, alert and manage patient care without being physically present bedside [5]. Remote ICU surveillance technology amid COVID-19 pandemic has the following benefits:

- Flexible, agile and more economical system
- Allows experienced intensivists to remotely monitor the status of many patients in ICU over a smartphone.
- Ensures continuous vital physiological monitoring round the clock.
- Sudden clinical deterioration can be detected earlier and onsite clinicians can be alerted to intervene timely.

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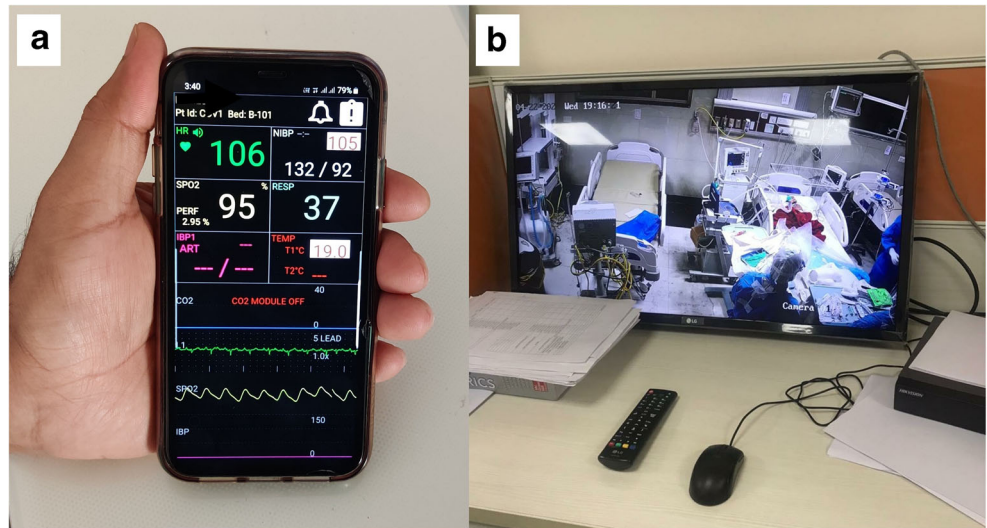
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Fig. 1 Remote patient monitoring using (a) Smartphone and (b) Closed-circuit television (CCTV)



- Ensures quality health care with limited resources and personnel.
- Allows quarantined intensivists to monitor from an offsite location.

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Compliance with Ethical Standards

Conflict of Interest All authors report no conflicts of interest to declare.

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