

# Telemedicine in the Intensive Care Unit

## Its Role in Emergencies and Disaster Management



Daniel M. Rolston, MD, MS<sup>a</sup>, Joseph S. Meltzer, MD<sup>b,\*</sup>

### KEYWORDS

- Telemedicine • Tele-ICU • Tele-intensive care • Telemonitoring • Disaster
- Disaster response

### KEY POINTS

- Earthquakes are the most deadly and the most costly of all natural disasters because of the large amount of damage to infrastructure that they inflict.
- Satellites are the most reliable method of communication and telemedicine after a disaster.
- Triage patients to prioritize those who need the most urgent care is essential to disaster response and a potential area of improvement through telemedicine.
- Effective emergency mass critical care (EMCC) coordinates the use of medical equipment and supplies and hospital personnel and facilities to maximize survival of the greatest number of patients. Telemedicine has the ability to improve all areas of EMCC.
- Technological advances will improve smartphone and wireless monitoring in the future, which can greatly advance telemedicine in disasters and tele-intensive care units (ICUs).

### INTRODUCTION

#### *Telemedicine*

The World Health Organization defines telemedicine as “The delivery of healthcare services, where distance is a critical factor, by all healthcare professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation,

---

Disclosure statement: The authors have no disclosures to report. The authors do not accept any money or have any affiliations with outside organizations. No monetary funding was provided for writing this article.

<sup>a</sup> Department of Emergency Medicine, Ronald Reagan UCLA Medical Center, David Geffen School of Medicine at UCLA, 757 Westwood Plaza, Los Angeles, CA 90095, USA; <sup>b</sup> Department of Anesthesiology and Perioperative Medicine, Ronald Reagan UCLA Medical Center, David Geffen School of Medicine at UCLA, 757 Westwood Plaza, Suite 3325, Los Angeles, CA 90095-7403, USA

\* Corresponding author.

E-mail address: [jmeltzer@mednet.ucla.edu](mailto:jmeltzer@mednet.ucla.edu)

Crit Care Clin 31 (2015) 239–255  
<http://dx.doi.org/10.1016/j.ccc.2014.12.004>

[criticalcare.theclinics.com](http://criticalcare.theclinics.com)

0749-0704/15/\$ – see front matter © 2015 Elsevier Inc. All rights reserved.

and for continuing education of healthcare providers, all in the interests of advancing the health of individuals and their communities.”<sup>1</sup> Telemedicine has evolved from the transmission of information via telephone in the early 1900s to video transmission by microwave in the 1960s to telesurgery via satellite transmission in the 2010s.<sup>2</sup>

Telemedicine can be delivered either in real time or as store-and-forward information. Real-time telemedicine provides the benefits of interaction, examination, data collection, and monitoring; however, it often requires high bandwidth (data transfer rate) especially if videoconferencing is being used. Store-and-forward telemedicine is typically used for electrocardiography (ECG), radiology, or photographs. It requires less bandwidth and can be accomplished with less reliable networks.<sup>2</sup>

### ***Tele-ICU***

---

With the unequal distribution of intensivists in the United States, tele-intensive care or tele-ICUs have been proposed and have been used as a way to fulfill the shortages. Several studies and a meta-analysis have found a benefit to implementation of a tele-ICU<sup>3-5</sup>; however, others have not,<sup>6</sup> including a before-and-after study from the Veterans Affairs Hospitals, which found no improvement in mortality or length of stay with the addition of a tele-ICU program.<sup>7</sup> Tele-ICUs are generally organized in a centralized or decentralized model. In the centralized model, the telemedicine center is a specific location with physicians and nurses who typically provide care 24 hours a day to many different hospitals. A centralized model has and can continue to be implemented in disasters because an incident command center, while functioning to organize the response to a disaster, could also provide a centralized location for consultation to local hospitals, overflow facilities, or mobile ICUs. Although the centralized model provides an organized approach to telemedicine with more stable means of communication, this model is likely to be more expensive because it requires overhead, consisting of a permanent to semipermanent location equipped with technology to provide intensive care response.

Large disasters would likely involve a combination of a centralized and a decentralized model. The decentralized model is organized with the ICU or mobile ICU at the center, and then telemedicine consultation is provided from multiple individual locations.<sup>2</sup> This model can be used for nighttime rounding by a staff of intensivists, who all have access to a telemedicine workstation at home. It has been used in the disaster setting, during a blizzard in the Baltimore area in 2010; however, this was a situation in which the decentralized model with a robot for nighttime rounding was already in place before the disaster.<sup>8</sup> The decentralized model may also be useful to obtain specialist consultation, such as a dermatologist or infectious disease physician to evaluate a rash seen in many survivors of a hurricane. As the smartphone technology improves, this model will likely become easier to use and less expensive because the telemedicine consultant will not need to be at a telemedicine workstation. Telemedicine “apps” have already been created and could be ideal in the disaster setting. In addition, tele-ICUs can also be organized in continuous care, scheduled care, reactive care, or consultative care models. Scheduled care is typically used for nighttime rounds, whereas reactive care involves an on-call telemedicine consult. Consultative care refers to the use of telemedicine for consultation on cases when additional expertise is needed.<sup>2</sup>

### **DISASTERS**

The Centre for Research on the Epidemiology of Disasters (CRED) defines disaster as “a situation or event, which overwhelms local capacity, necessitating a request to national or international level for external assistance.”<sup>9</sup> In addition, for a disaster to be

Download English Version:

<https://daneshyari.com/en/article/3108171>

Download Persian Version:

<https://daneshyari.com/article/3108171>

[Daneshyari.com](https://daneshyari.com)