Work System Barriers and Strategies Reported by Tele-Intensive Care Unit Nurses
A Case Study

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KEYWORDS

- Virtual teams • Dynamic relationships • Intensive care units • Tele-medicine

KEY POINTS

- There is a shortage of intensive care personnel, both intensivists and critical nurses.
- This shortage can partly be remediated by implementation of tele-intensive care units (ICUs).
- The literature shows that tele-ICUs can have several benefits, but that the virtual collaboration between personnel in the ICUs that are monitored and the tele-ICU can be difficult.
- Tele-ICU nurses have to deal with many different hospitals, ICUs, ICU staff, health information technology, medical devices and protocols, which makes their jobs difficult.
- This lack of familiarity can cause all kind of barriers and tele-ICU nurses have to develop strategies to manage these barriers.

INTRODUCTION

Intensive care units (ICUs) are highly complex organizations where lives are hanging by a thread. Approximately 400,000 to 500,000 people die each year in American ICUs.[1,2] The highly complex environment and great responsibilities put a burden on

ICU staff. There is a shortage of ICU personnel,[3–7] and in the past decades, the number of critical care beds has increased, whereas the number of hospitals offering critical care services has decreased. Tele-ICUs may be a solution for the shortage of ICU personnel. In a tele-ICU, patients are monitored remotely by physicians and nurses trained in critical care. A tele-ICU nurse can monitor up to as many as 50 ICU patients in different ICUs and hospitals. Tele-ICU nurses use the most recent technology that provides access to patient information as well as video and audio links to patient rooms. Tele-ICU physicians and nurses collaborate with physicians and nurses in the ICUs in what can be considered virtual teams.

We know little about the collaboration between staff in the tele-ICU and ICUs in this type of virtual team. Tele-ICUs are virtual teams that pose unique challenges because of their dynamic and fluid membership: tele-ICU nurses and physicians have to deal with many ICUs simultaneously.[8] In this article, we describe the work system barriers experienced by tele-ICU nurses and identify strategies tele-ICU nurses use in dealing with these barriers. We also explore the negative or positive consequences of strategies.

BACKGROUND

Tele-ICUs are units where intensivists and nurses provide 24/7 care, support, and advice from a distance to remote ICUs. Various forms of health information technology are used to support the sharing of information between the tele-ICU and the ICUs. Technologies allow tele-ICU intensivists and nurses to monitor patients, to observe patients and medical devices in the patient room though a camera, and to communicate with ICU nurses and providers. Several studies provide a detailed description of the evolution of the tele-ICU, the tele-ICU organization, and tele-ICU nurses' activities.[3,7,9–13] Tele-ICUs are a relatively new phenomenon; the "oldest" tele-ICU has been in existence for more than 15 years.[3] Nearly 10% of patients in American ICUs are currently monitored by tele-ICUs.[9]

The tele-ICU team can be composed of multiple clinicians: board-certified intensivists, critical care nurses, clerical personnel, and, in some instances, a pharmacist. Personnel in the ICU (including residents on duty in the ICU) receive instructions or guidance from the tele-ICU staff and may have the opportunity to learn new skills and knowledge.[14] Tele-monitoring is crucial to the tele-ICU model. Personnel in the tele-ICU receive patient data in real time and, therefore, can detect trends in patient status; they can then alert personnel in the ICU.[15]

Tele-ICU physicians and nurses work at workstations that are commonly composed of multiple monitors, a 2-way camera, microphone, and a high-speed dial phone. Clinical data captured about the ICU patient are directly streamed to the tele-ICU. Tele-ICU clinicians depend on information communicated over the phone or entered into the computer from the bedside to inform them on the current state of the patient. They monitor numerous clinical indicators, such as blood pressure, heart rate, ventilator settings, and oxygen saturation. Other data such as patient care plans, laboratory results, and radiographs are send electronically or faxed to the tele-ICU. Most tele-ICU software uses "smart alarms" to alert the clinicians to possible significant changes in patient status.

Tele-Intensive Care Unit Literature

Most studies on the tele-ICU have focused on clinical and financial outcomes.[16–22] Several studies have reported that the implementation of an ICU telemedicine program can improve clinical care outcomes (eg, reduced duration of stay, reduced