

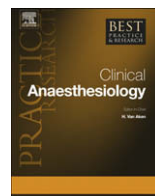


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Tele ICU: paradox or panacea?

Adam Sapirstein, MD, Assistant Professor^{a,*}, Nazir Lone, MD, Patient Safety Scholar^{b,1}, Asad Latif, MD, Instructor^a, James Fackler, MD, Associate Professor^a, Peter J. Pronovost, MD, PhD, Professor, Departments of Anesthesiology and Critical Care, Surgery, and Health Policy and Management, Medical Director, Center for Innovations in Quality Patient Care, Director, Quality and Safety Research Group^a

^aDepartment of Anesthesia and Critical Care Medicine, The Johns Hopkins University School of Medicine, 600 North Wolfe Street, Baltimore, MD 21287, USA

^bThe Johns Hopkins Bloomberg School of Public Health, 615 N. Wolfe Street Baltimore, MD 21205, USA

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Telemedicine has been studied in the intensive care unit for several decades, but many questions remain unanswered regarding the costs and the benefits of its application. Telemedicine ICU (Tele-ICU) is an electronic means to link physical ICUs to another location which assists in medical decision making. Given the shortage of intensive care physicians in the US, Tele-ICU systems could be an efficient mechanism for physicians to manage a larger number of critical care patients. This chapter will examine the current state of telemedicine in an age of rapidly expanding medical information technology and increasing demand for intensive care services. While we believe that the future of Tele-ICU is promising, there are multiple issues that must be addressed to increase the benefit of Tele-ICU. Tele-ICU is expensive to deploy and use, it may add burdens to existing intensivists, and it requires organizational and culture changes that can be difficult to accomplish.

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* Corresponding author. Department of Anesthesia and Critical Care Medicine, The Johns Hopkins University School of Medicine, 600 North Wolfe Street, Halsted 842B, Baltimore, MD 21287-7294, USA. Tel.: +1 410 614 9920; Fax: +1 410 614 1776.
E-mail address: asapirs1@jhmi.edu (A. Sapirstein).

¹ Current address: The University of Missouri-Columbia, One Hospital Drive, 65201, MO, USA.

Introduction

The application of telemedicine techniques to intensive care unit (ICU) care was first described in 1982 and has undergone continuous development since then.¹ Tele-ICU is the concept and practice of using electronic means to convey information from an ICU to another location where it can be used to aid medical decision making. Given the shortage of intensive care physicians in the U.S, tele-ICU systems could help provide an efficient mechanism to bring critical care specialists to a larger number of patients. In spite of tremendous improvements in the technological basis of and investments in tele-ICU systems the goals of “alleviate[ing] scarcity and misdistribution of critical care services” remain unmet.¹ Though tele-ICU services have grown substantially in the last decade, many of the questions regarding effectiveness, efficiency, and total costs of tele-ICUs systems are unanswered. This review will examine the current state of telemedicine in an age of rapidly expanding medical information technology and increasing demands for intensive care services. There are several recent reviews and reports on tele-ICUs that provide excellent and accurate information regarding the effectiveness of tele-ICU services.^{2–5} Our goals are more practical. In this manuscript we will consider some of the logistical aspects of tele-ICU that we have learned during an on-going evaluation process.

Methods

To identify information regarding tele-ICU, we conducted an informal literature review, site visits, and focus groups. To identify literature regarding tele-ICU, we used the following MeSH headings: Telemedicine, critical care, intensive care and MeSH subheadings: manpower, organization and administration, economics to perform PubMed searches of the National Library of Medicine. Additional resources were located through the University HealthCare Consortium (UHC), on-line search engines and corporate web sites. Between September 2006 and November 2007 we (AS, JF) conducted site visits to 4 organizations that have implemented tele-ICU services We conducted interviews with the 2 major vendors for tele-ICU services (iMDsoft, Nedham, MA.; VISICU Inc., Baltimore, MD.). During our evaluation a third tele-medicine vendor discontinued their product (Cerner Corp., Kansas City, MO.). Finally, we held focus groups with clinical, administrative, and technological leaders at Johns Hopkins Hospital who are considering implementing a tele-ICU service.

Why consider tele-ICU?

The concept of tele-ICUs has existed for over 25 years and some of the reasons to consider tele-ICU remain the same today.¹ The driving force behind tele-ICUs is the promise that they improve patient care and provide an efficient mechanism to bring critical care specialists to a larger number of patients and for a longer period of time. This may occur through a number of mechanisms which include: 1) providing ICU physician staffing to ICUs that do not have intensivist staffing –the “enhanced staffing model”, 2) extending the duration of ICU physician oversight – the “enhanced supervision model”, 3) increasing compliance with evidence-based guidelines – the “enhanced compliance model” and 4) allowing earlier recognition of events in which early action can have significant impact – the “early warning model”. These processes are not mutually exclusive and a single tele-ICU system may incorporate several but not necessarily all of them.

ICU staffing

There is no universally accepted optimum ICU physician staffing (IPS) model.⁶ While the general premise among intensivists is that more ICU physician staffing (*ie.* greater intensity) is associated with improved outcomes, a single study questioned this long-held belief.⁷ Nevertheless, the bulk of evidence and general perceptions support the model of an intensivist-led team providing daily care to all patients in the ICU. Pronovost and colleagues found that there was significant survival benefit for patients following repair of abdominal aortic aneurysms when an intensivist rounded daily in the ICU.⁸ A subsequent study of patients that underwent esophageal resection found that intensivist daily rounds in the ICU resulted in significant reductions in hospital length of stay and complications.⁹ More

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