



# Emerging Best Practices for Tele-ICU Care Nationally

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Intensive care units (ICUs) are a vitally important component of health care in U.S. hospitals, treating six million of the sickest and oldest patients every year. The choices about how to manage ICUs carry high stakes: ICUs have both the highest mortality and the highest costs in health care, accounting for 4.1 percent of the nation's \$2.6 trillion in annual health care spending, or nearly \$107 billion per year.

Adding to the complexity of these ICU management decisions is the collision of two strong trends: the increasing number and severity of critical care patients as the U.S. population ages, and the decreasing supply of critical care physicians available to manage the growing number of ICU patients.

Tele-ICU, a telemedicine technology, has the potential to address this critical care staffing shortage. As a network of audio-visual communications and electronic monitors of patient vital signs, tele-ICUs enable clinicians in one "monitoring center" to remotely monitor, consult and care for ICU patients in multiple and distant satellite centers. By increasing the number of ICU patients that critical care teams can manage, tele-ICUs effectively extend both the productivity and the reach of the specialists.

As of the fall of 2012, there were 54 civilian and government tele-ICU monitoring centers in the U.S. These monitoring centers were owned and operated by academic medical centers, by regional hospitals, by health plans, by the Veterans' Health Administration (VHA) and by commercial firms. Most (nearly 90 percent) of the technologies used by these monitoring centers are virtually identical, and to a large extent tele-ICU practice patterns have also been consistent across users. However, in the past few years, the field has seen experimentation and variation in the practices that clinicians use in deploying tele-ICU systems.

Many of these emerging new patterns of use have the potential to make tele-ICU coverage more scalable and accessible to more hospitals and more beds. This report, based on data collected through October 2012, is the latest in NEHI's research begun in 2003 examining the clinical and financial benefits of using telemedicine in ICUs. It highlights some of the most promising, emerging best practices in tele-ICU care and focuses particularly on those that make tele-ICU care available more broadly. Any plan enabling the expansion of tele-ICUs should consider the emerging best practices highlighted in this brief.

## **The Evolving Tele-ICU Market**

Most indicators suggest that use of tele-ICUs nationally is on the threshold of major change. Increased market competition and experimentation in new usage patterns is likely to push tele-ICU care toward a more scalable and potentially more widely available technology.

### *Product and Provider Options*

For over a decade, Philips/VISICU has had the only viable tele-ICU technology for medical centers, hospitals or even private businesses, such as Advanced ICU Care, to purchase. The Philips' system is an open system that is able to work with any and all other systems. The prevalence of the Philips/VISICU model notwithstanding, some medical centers are now taking the route of creating "homegrown" tele-ICU programs in which they design their own systems, purchasing some components and building others.

Other manufacturers whose products are reportedly being used in hospitals include REACH, whose audio-visual consultation systems have been used for tele-stroke and specialist tele-interventions, and also the In-Touch Robot which is being used by medical centers for distant consultations in neurology and in pediatric care. Another new entrant is Bernoulli Virtual Bedside, used primarily for remote cardiac consultations. To date, these technologies have had more limited clinical applications than Philips' more comprehensive, integrated system. Additionally, the market is seeing a greater variety of tele-ICU coverage providers. Thus far, Advanced ICU Care has been the only firm offering tele-ICU provider coverage in the U.S. Advanced has had no competitors other than medical centers and hospitals willing to extend coverage outside of their own systems. In September 2012, Performance ICU announced that it would be offering tele-ICU coverage to hospitals first in the state of California and then nationally, using the Bernoulli Virtual Bedside for its ICU patient audio-visual connectivity and tracking system.

### *A More Efficient Market*

With new entrants to the tele-ICU market, the country may see competition among product developers and providers of tele-ICU coverage based on fees, specialty offerings, and alignment of other telehealth services such as tele-stroke. Despite these market changes, many hospitals still do not have the knowledge or senior staff time to be informed purchasers of tele-ICU coverage as information about what are "fair market" offerings remain scarce. Fee structures and coverage terms have thus far been held confidential by industry vendors as part of their contracts with client hospitals.

In the future, tele-ICU technology should be able to transition from a capital-intensive technology with modest dissemination to a more affordable and scalable technology that can reach hospital settings such as county, public, rural and critical access hospitals across the country. As tele-ICU continues to spread, the need for best practices to inform widespread adoption and implementation is increasingly critical.

## **Tele-ICU Best Practices**

As the market evolves and health systems and clinicians become more experienced with tele-ICU, a number of best practices have emerged. NEHI has catalogued these best practices through extensive research of the market and by examining implementation and practice patterns across the country. They include:

- 1. Collect pre-coverage outcomes during a six-month period prior to tele-ICU initiation.** By gathering baseline data, administrators are better able to assess where improvements have been achieved and where more implementation work is needed.

Few ICUs or monitoring centers are able to collect reliable pre-tele-ICU data because pre-data collection is a challenging and costly undertaking for most ICUs. Unless detailed electronic, longitudinal case records are in place and connected with severity measures (to support severity adjustments), pulling out pre-coverage data can require "records archeology" that links multiple systems. For this reason it is seldom done, and the field of tele-ICU outcomes assessments is greatly restricted by the paucity of reliable outcomes research.

John Muir Health, a regional medical center and community hospital in California, appointed its e-ICU Operations Manager more than 8 months prior to implementation of their VISICU system. This was an unusual step; Advanced ICU estimates that most of their clients appoint a manager for the ICU coverage only a month or two prior to the roughly four-month implementation process.

John Muir's comparatively early appointment of an ICU program manager enabled the staff to begin a pre-implementation study of ICU patient data over a two-year period. Case data were collected for patient stays in the ICUs and in the hospital post ICU discharge. These data included APACHE scores so that both pre and post data could be controlled by the same severity scoring system. (The VISICU systems use APACHE scoring.) John Muir was able to report 18 months after their coverage went live that they had seen an 18 percent reduction in hospital deaths, a 45 percent reduction in ICU deaths and a 54 percent reduction in ICU LOS days. These findings helped John Muir to be recognized by the VHA West Coast for innovation in critical care and have also supported internal validation of the decision to move to tele-ICU coverage.

- 2. *Extend coverage to hospitals unaffiliated with the monitoring center.*** Administrators in unaffiliated tele-ICU satellite centers can be resistant to having care directed by clinicians in a different health system. Several tele-monitoring centers have used creative practices to overcome this resistance.

The dominant pattern of the past 13 years of tele-ICU adoption has been for a medical center and its health system to acquire a monitoring center to establish coverage to the adult ICUs in its health system. The motivations may be to solve problems in hiring and retaining intensivists or ICU nurses, to shorten the ICU length of stay or to claim competitive advantage over other systems.

After the first several years of establishing "home coverage," the medical center then begins to consider extending coverage to other hospitals outside of its system. Extending coverage beyond affiliated hospitals often requires more negotiation of terms, protocols and roles than within a single system. This phase of offering to extend coverage beyond the health system can easily require several years before contracting and implementation are complete.

At present, most tele-ICU monitoring centers cover only hospitals in their own system. But a growing proportion of monitoring centers are now finding other hospitals in their region to become clients of their tele-ICU support centers. Some examples include the University of Wisconsin (covering two out-of-system hospitals) and Christiana (where six of the eight hospitals they cover are out of their network). The advantages of providing coverage to non-associated hospitals include receiving fees from the client hospitals to help offset staffing and operating costs of the monitoring center and also solidifying relationship and referral patterns with the client hospitals.

Coverage can, of course, be extended well beyond a single region. The chief constraint on interstate extension of coverage is licensing of the monitoring center MDs for all states in which coverage is provided—an administrative burden but not necessarily a barrier. Several medical centers—Avera Health and Banner Health for example — maintain coverage in multiple states and require their intensivists to maintain licenses in those states as well. In theory, a monitoring center with a sufficiently broadly licensed panel of MDs could cover ICUs in every state. In practice, the broadest geographic coverage has been achieved by Advanced ICU Care, which monitors ICUs in eighteen states from its monitoring centers in St. Louis and Manhattan.

- 3. *Rotate clinicians through bedside and monitoring center shifts.*** The more widely a monitoring center's coverage capacity is leveraged, the more human glue is needed to support collaboration between the monitoring center and bedside clinicians.

Rotating clinicians through shifts both in the monitoring center and at the critical care bedside has become a common and widely recommended practice. The theory behind this practice is that the rotation limits opportunities for “us versus them” friction between bedside and monitoring center staff and improves clinical skills while broadening perspectives. A majority of programs have some required rotation for nurses as well as MDs and also encourage or require that their bedside rotations are in an ICU covered by the monitoring center. Each system using rotation expressed satisfaction with the practice. As a result of this practice, some found its value in improving bedside and monitoring center cooperation and others in training physicians and nurses.

Centers that had considered rotations, but decided against them, reported similar reasons for not adopting monitoring center – bedside rotations. They cited problems such as the complexity of scheduling shifts, of some nursing monitoring center staff being resistant to or physically unable to do bedside ICU tasks, and of objections from ICU MDs to having fellows or residents in the monitoring center. Another common reason for foregoing rotation was the physical commute required for clinicians to work in the monitoring center and at a remote outlying hospital.

- 4. Cover critical access and rural hospitals.** Tele-ICU offers a potential solution to the lack of coverage for public and safety-net hospitals across the country.

Rural and critical access hospitals are almost all in need of critical care clinicians to diagnose, manage, stabilize and make transfer decisions concerning their most complex patients. Two key impediments to tele-ICU coverage of rural and critical access hospitals have been the costs of extending and maintaining coverage to a limited number of ICU beds and a lack of bedside clinicians in these hospitals to implement care directed from the tele-ICU.

Of the 54 monitoring centers in the U.S., fewer than half (21) cover any rural or critical access hospitals. Several well-regarded health systems (Avera Health and Maine Medical Center) covered multiple rural and/or critical access hospitals and have demonstrated that coverage can be successfully extended to these hospitals. Mercy Health—one of the tele-ICU providers with the largest number of beds covered (480 beds as of October, 2012) – has received a grant from the U.S. Agriculture Department to extend coverage to 24 rural hospital beds in the Midwest. Emory University Hospital currently has a Centers for Medicare and Medicaid Services Innovation grant to test an approach that combines tele-ICU coverage from Emory with bedside clinical staffing by Emory-trained physician assistants (PAs). These PAs will have an additional six-month training period to prepare them for bedside critical care with tele-ICU coverage. This newly designed program is reported to focus on skills needed for bedside procedures performed under tele-ICU direction.

- 5. Extend coverage outside of the ICU through wired beds and mobile carts.** This approach is being widely used to support both small and isolated hospitals and crowded urban hospitals.

One of the most interesting variations in practice patterns is the use of the tele-ICU monitoring center to extend coverage to critically ill patients in other departments of the hospital and to post-discharge settings. Given the capital costs of tele-ICU connectivity to a hospital (roughly \$100,000 to \$200,000 per hospital) and the relatively modest costs of per bed connectivity and equipment (roughly \$7,000 to \$12,000), including more bed coverage to critical patients in other parts of the hospital has clear advantages. The operating costs or coverage fees and licensing are the same for an additional bed regardless of where it is located in the hospital.

Most hospitals report that their reasons for seeking additional coverage include interest in improving throughput for critical care patients and reducing the risks of complications and readmissions to the ICU after discharge to a step-down unit. In addition, Emergency Departments equipped with “tele-covered beds” can hold patients waiting for an open ICU bed. The patient can be monitored and managed by the clinicians in the monitoring center and their admission documents prepared while waiting for an ICU bed.

The most popular arrangement for coverage outside of the ICU appears to be the use of mobile carts. Currently more monitoring centers report coverage to mobile carts than to any non-ICU fixed bed site in the hospital. Of 51 monitoring centers, 19 reported coverage to fixed beds outside the ICU, while 30 reported coverage with mobile carts. (The 19 and 30 monitoring centers overlapped.) Mobile carts have the same cost and most of the functions as a fixed wiring system. Some programs, such as Advanced ICU Care, report that the carts tend to be put aside and not used. However, other programs value the flexibility of the cart and the option of being able to move the cart next to any bed in any department to establish coverage.

Of the 30 hospitals that reported having mobile carts, five have carts that are available to any department in addition to having mobile carts dedicated to selected departments. The most frequently reported use of the carts was for the ED and the rapid response team. Tele-ICU users have also found additional, inventive uses for the mobile carts to meet their particular needs. For example, the University of Minnesota reports using mobile carts to support interviews with patients where an interpreter is needed, while Mercy reports using its carts to facilitate specialist consultations.

6. ***Make a business of “renting” tele-ICU coverage to hospital clients.*** Like many other hospital services, tele-ICU coverage can be a contract service to hospitals and does not have to be owned and run by a medical center or hospital. Coverage of more beds and more hospitals appears to lower the per bed operating costs of a monitoring center.

Advanced ICU Care was formed in 2005 as a restructuring of the bedside intensivist staffing service Critical Care Services. Advanced began coverage of its first tele-ICU client, St Mary’s Health Center in Jefferson, Missouri, in 2006. Advanced became the first licensee with rights to the VISICU tele-ICU coverage to third party hospitals and medical centers.

Advanced is staffed around the clock with four to five intensivist physicians and nurses and offers clients a standard 24/7 hub monitoring program that includes:

- Reviewing each ICU admission for appropriateness for ICU care, treatment protocol and planned discharge;
- MD intensivist rounding on each patient every 12 hours;
- Nurse intensivist rounding on each patient every 12 hours; and
- Preparation and review of ICU discharge documents.

Advanced has built a client base in medium to small hospitals and medical centers that are unable to make or justify the capital investment required to build their own hub. Advanced sees its next development stage as offering coverage to much larger medical centers and health systems. Expanding to large hospitals with more tertiary cases and more complex case throughput challenges than community hospitals may require Advanced to modify its care and fee approach.

## **Conclusion**

Tele-ICU care appears to be entering a second phase of development that will be marked by more diversity in tele-ICU care practices and more experimentation in the use of remote monitoring of critically ill patients. These

new usage patterns and business models will provide valuable data and experience for adopting tele-ICU care more broadly around the country and to hospitals with the most need and the highest likely benefit.

The most promising of these emerging best practices detailed in this report offer the means to make tele-ICU coverage more scalable and accessible, and to make possible larger and more diverse coverage patterns from each monitoring center. Any plan for directing the expansion of tele-ICU coverage would do well to consider fostering these emerging best practices.