Telemedicine Delivers Healthy Medical and Financial Benefits to ICUs

By Deborah Popely
You may not know it, but every day and night critical care doctors and nurses are helping save lives from across town—or even across the country—through the emerging technology of critical care telemedicine or the “virtual ICU.”

Like air traffic controllers, intensivist-led care teams sit at command center computer consoles that can be located thousands of miles away from the hospital, monitoring ICU patient heart rates, blood pressure, respiration and other vital signs. Using software benchmarks, the teams can intervene earlier, before complications occur, by alerting on-site teams and arming them with detailed, real-time information to make rapid decisions at the bedside.

Software company Philips VISICU developed the technology that makes this possible as a way to address the scarcity of critical care physicians and nurses, but sophisticated telemedicine programs like its eICU are also proving to enhance the quality of care, reduce complications and mortality, and bring down the cost of healthcare. The eICU program is currently in place in approximately 40 health systems serving more than 200 hospitals in 28 states. Philips VISICU reports that as of 2008, the eICU program was monitoring 300,000 ICU patients per year or approximately 10 percent of the adult ICU patient population. Integration of telemedicine technology is likely to expand as the population ages and critical care needs grow. Only 10 to 20 percent of U.S. ICUs employ intensivists, according to a study published in the March 2006 edition of Critical Care Medicine. A 2006 Health Resources and Services Administration (HRSA) report to Congress showed that intensivist demand could be 129 percent above the current supply by 2020. Other HRSA reports predict the problem will be compounded by a deepening nursing shortage in specialty areas, especially for experienced nurses.

The federal stimulus package may accelerate the adoption of technology for many hospitals, as the new administration looks to technology to improve efficiency and drive down the cost of healthcare delivery.

Experience Curve
Ministry Health Care’s Saint Clare’s Hospital in Weston, Wis., first started looking into a virtual ICU to access a larger number of intensivists than the hospital could recruit on its own, according to Chief Medical Officer Larry T. Hegland. “It would take a staff of four to five physicians to provide the round the clock coverage we need,” says Hegland. With only one intensivist on staff, Saint Clare’s turned to St. Louis-based Advanced ICU Care to get the 24/7 support it needed.

Hegland stresses that the Advanced ICU Care team is not meant to replace the on-site physician and care team, but rather to enhance the level of patient care and safety. The Leapfrog Group says that 54,000 ICU deaths per year could be avoided with intensivist staffing. A study published in The Journal of the American Medical Association in November 2002 indicated that intensivist staffing can reduce risk of death in ICUs by 39 percent.

According to Director of Operations Gary L. Anderson, RN, FACHE, Advanced ICU Care began as a regional initiative to help staff Saint
Mary’s Health Center in Jefferson City, Mo. The freestanding practice now employs 18 board certified, fellowship-trained physicians, along with certified critical-care nurses and other clinical staff, serving 14 hospitals and 159 beds with an average daily census in the low 100s.

“Outsourcing is a good solution for smaller or more rural hospitals or health systems that may not have the resources, infrastructure or staffing to do it themselves,” says Anderson.

While Saint Clare’s looked outside for support, Chicago-based Resurrection Health Care decided to develop its own program now serving 182 critical-care beds in seven of its Chicago-area hospitals and one long-term-care hospital with a staff of 25 physicians and 25 FTE nurses. “The corporation was hungry for it,” says Operations Director Rebecca Rufo, RN, DNSc, whose team implemented virtual ICUs at eight locations in 15 months. “In developing our program, we worked hand in hand with our executive team to understand what (it is) looking for in terms of quality outcomes, best practices and financial benefits,” she says.

Gaining Acceptance

Far from the “robo-medicine” some might fear, the virtual ICU has been well-accepted by both patients and staff involved in critical care.

“Families like it because it gives them greater peace of mind. They feel that their loved one is receiving the highest quality of care around the clock, seven days a week,” says Pat M. Shehorn, FACHE, executive vice president and CEO at Resurrection Health Care’s Westlake and West Suburban Hospitals.

It helps that the patient rooms aren’t the least bit scary, says Shehorn. In fact, it’s hard to tell a virtual ICU room from a conventional one because most of the technology is hidden or unobtrusive. “We are very careful about patient privacy, and we only turn on the high-intensity camera when needed,” she says. “We have a doorbell that we ring for permission to enter.”

Nurses are particularly positive about the system, says Shehorn, because they have immediate access to an intensive care physician at any time. This is particularly important in the middle of the night, when they can press a button and immediately reach a physician who has real-time information at his or her fingertips.

Anderson has noted a reduction in nurse turnover of almost 30 percent at the original Advanced ICU Care client facility, due in part to the benefits of the virtual ICU program. Physician reactions to the technology vary, says Saint Clare’s Hegland, but most doctors are generally won over once they meet the telemedicine team, which is one reason the Advanced ICU Care doctors meet face to face with the hospital staff on a quarterly basis. “Once they interact with the telemedicine doctors, staff
physicians recognize that they are good doctors, board certified in critical care, pulmonology and other specialties.” The telemedicine doctors have privileges at the hospitals they serve and most deliver bedside care at community hospitals in the St. Louis area. “At first some (hospitals) only allow the telemedicine physicians to monitor patient status, but once they get comfortable with the system, most let the virtual ICU doctors write orders as well,” he says.

“Stellar” Clinical Outcomes

The ability to prevent complications and avoid medical errors is one of the most compelling benefits of the virtual ICU. Both Saint Clare’s and Resurrection Health Care have documented impressive reductions in complications, mortality and length of stay, largely due to the early warning system embedded in the Philips VISICU software. These “red flags” alert doctors and nurses of physiological changes hours before a crisis occurs.

“We are achieving stellar results—40 percent better than would be predicted by APACHE IV (ICU predictive modeling) reports. For instance, since we’ve had the system in place, we never had a ventilator-associated pneumonia,” says Hegland.

Resurrection Health Care recently presented data from 12,000 patients treated from 2006 to 2008 at 13 Resurrection ICUs at the Health Information and Management Systems Society (HIMSS) conference that showed dramatic declines in mortality (41 percent), deep vein thrombosis (3 percent), length of stay (38 percent) and blood transfusions (7 percent) in the first six months. At one year, mortality was down 43 percent and length of stay was down 30 percent across the system as it continued to implement new sites. According to Rufo, the reduction in length of stay alone saved Resurrection Health Care $3 million.

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By tracking patient care data closely and sharing real-time performance data with clinicians, the virtual ICU helps improve care. “We are able to improve quality and standards of practice by exposing the medical staff to information and best practices that they may not have been aware of,” says Anderson. For example, integrating information into the daily management reports about the American Society of Critical Care standard for blood transfusions has resulted in a dramatic reduction in the number of blood transfusions, reducing blood utilization and related complications, according to Anderson.

Another reason for these outstanding findings is that “overall documentation is higher quality and there is better data integrity,” says Rufo. “More people using better reports means better decision making at the bedside. We have integrated nine different evidence-based protocols, which ensure a higher level of care throughout the system.”

“You don’t want to remove the expert clinician from the equation,” Anderson adds. “But good data and technological support can make well-trained people even better.”

Costs and Benefits

There is no question that implementing a virtual ICU program is costly—especially because there is no reimbursement mechanism yet for the service. Resurrection has invested $6.7 million in staff time, technology, construction and training to establish its systemwide program.

Outsourcing through a vendor such as Advanced ICU Care requires an outlay of $25,000 to $50,000 per bed to cover the cost of construction, equipment and training. According to Advanced ICU Care’s Anderson, an outsourced system can nevertheless save 50 percent of the total cost, taking into consideration staffing, information technology and start-up expenses. “It just makes sense at a time when CEOs and hospitals are challenged to squeeze more care from fewer dollars,” he says.

Despite the costs, everyone agrees the benefits—clinical and financial—make it worth the investment. For
instance, by preventing complications and potential lawsuits. Resurrection is projecting a savings of $5 million to $6 million. Moreover, says Rufo, because of the system, managed care payors are reimbursing at higher than negotiated rates.

Shehorn cautions that hospitals should go into this for the right reasons. “From a risk-reduction perspective, if we can avoid one patient a year dying, it’s been worth the investment. Improving quality of care has to be our primary goal. It just happens that excellent care costs less,” she says.

### Making It Work

In addition to adequate medical and technical support staff, connectivity, interfaces and well-designed

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**Mortality and Length of Stay Research**

**National Sample**

An analysis of severity-adjusted data from 185,464 patients treated in intensive care units (ICUs) supported by Philips VISICU’s eICU program during the period Jan. 1, 2006, to Dec. 31, 2007, shows actual hospital mortality rates of 9.6 percent compared to the national average of 13.5 percent.

- This is based on data supplied by 156 hospitals representing a mix of rural, urban, community and academic facilities around the country.
- The 29 percent decrease in mortality for this patient sample translates to 7,233 additional saved lives.
- The national average of 13.5 percent is referenced in a *Critical Care Medicine* article (2006 Vol. 34, No. 10 2519) reporting on the APACHE model for ICU benchmarking. This is based on data collected from 131,618 patients supplied by 45 geographically dispersed hospitals.

**Avera Health System**

Sioux Falls, S.D.

**Data reflect:**

- 70 networked ICU beds at 15 hospitals across 4 states
- 7,784 patients monitored by the eICU program
- Timing of research: 2003–2007

**Research results**

Research concluded that the eICU remote critical care program reduced severity-adjusted mortality and length of stay, as compared to one year prior to eICU implementation, saving the hospital system millions of dollars.

- 37 percent reduction in severity-adjusted mortality
- $8 million cost savings from reduction of 6,824 ICU days and 821 hospital days
- $1.25 million cost savings from 37.5 percent reduction in patient transfers
- Widespread acceptance of the program by intensive care staff and rural providers

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1 Benchmark research reflects severity-adjusted data taken one year before the eICU program was adopted and 2.5 years post-implementation of the program.

Source: Philips VISICU
workflows are needed to make the virtual ICU work.

“If (it’s) not already there, the virtual ICU pulls the facility rapidly into the digital age,” says Anderson.

In Saint Clare’s case, the hospital was already a 100 percent digital environment, so the integration was more streamlined. Other hospitals or systems need more time and effort to install the information technology, revise the workflows and train staff to do things in a new way.

“Going from a paper environment to an electronic world is a major change that makes an immediate impact,” says Rufo. In her experience, caregivers are excited and want to be a part of it, particularly nurses who bear the brunt of paperwork. “Bringing in the mobile laptop immediately reduces the burden and elevates the way of doing things,” she says.

According to Rufo, the kind of clinical data produced by the virtual ICU is an untapped resource, not just for doctors and nurses, but for the whole care team, including dieticians, pharmacists, respiratory therapists and even chaplains. Helping them gather, access and use this information requires intensive training and support.

Rufo has a team of 19 full-time employed RNs and 10 full-time employed data assistants at Resurrection. She and her nurses work closely with users for weeks before, during and after activation to ensure they understand the technology and interfaces. “This isn’t a train-the-trainer situation in which we prepare the supervisors to train everyone else,” she says. “We sit down with each and every doctor and nurse up front to position them for success with the program.”

Bridging the gap between clinical and information services (IS) is also critical, according to Rufo, and the virtual ICU “forces a newfound relationship between the two departments.” Traditionally, IS provides the application and expects the user to run with it. “To make this program work, the two camps need to work together, understand each other’s worlds and take joint ownership of the process,” she says.

“There are always going to be some staff members who are resistant to change,” says Anderson. “The key is to engage influencers and key physicians, such as the chief medical officers, medical director of the ICU and key specialty admitters, early in the process.”

It ultimately comes down to vision and leadership. “This isn’t something you install and walk away from,” says Rufo, who cites upper management’s direction and support in driving the necessary culture change as integral to the program’s success.

Data security and continuity of service are two other critical issues. To secure sensitive data and prevent service interruption, Saint Clare’s virtual ICU runs on a separate network and uses a dedicated T1 line with a redundant traffic system.

According to Hegland, service interruptions are extremely rare but can occur. “We have extensive downtime procedures in place, and we run frequent simulations to make sure we’re ready for anything,” he says. Downtime procedures involve reverting to pen and paper, phone and fax.

Advanced ICU Care backs up all data off-site in an encrypted repository that can be recovered by the hospital if needed. “I’ve had people ask me to print out a duplicate patient record for them from our back-up system,” says Anderson.

What the Future May Hold
As technology becomes a key strategy in healthcare reform, telemedicine is expanding into the emergency room, stroke care, long-term acute care and after-hours pharmacy. Experts foresee its application to other areas where specialists are in short supply, such as neurosurgery and neonatology.

Integrating new technology is good for healthcare because “it forces the hospital to look at how things are done and make them safer and more efficient,” says Rufo.

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