

The Picture of Health

With critical-care specialists in short supply, remote monitoring offers a high-tech solution

By **LAURA LANDRO**

Bleeding heavily after an emergency C-section last year, Jennifer Gale ended up in the intensive-care unit at Holmes Hospital in Melbourne, Fla. Throughout the night, the critical-care specialist on duty closely watched her vital signs, ordering additional units of blood until her condition stabilized.

But the doctor wasn't at her bedside—or even in the hospital. Working from a command center in a nearby office building, he was remotely monitoring her and other patients in six intensive-care units in three different hospitals operated by Rockledge, Fla.-based health system Health First. The monitoring system, known as an eICU, uses two-way video cameras and software that tracks patients' vital signs and instantly registers any changes in lab test results or physical condition. That enables doctors in the command center to spot early warning signs that a patient is taking a turn for the worse, advise bedside staff on giving medications and treatments, and point out potential errors or oversights.

Ms. Gale, 31, a high-school teacher and volleyball coach, says learning that a specialist was manning the eICU helped reassure her when she was frightened and distraught at being separated from her newborn. "I know he was watching me all night long," she says. "I really felt I was getting the kind of care I might not have received otherwise."

Far and Near

Remote monitoring is offering a high-tech solution to the vexing problem facing a growing number of hospitals: how to care for the sickest patients amid a worsening shortage of intensivists, the critical-care specialists trained in caring for life-threatening injuries or illnesses. Studies show that mortality rates are 30% to 40% lower in hospitals where intensivists are providing round-the-clock care to prevent complications and minimize errors, but only about a third of patients in the ICU today receive care from an intensivist. The federal Department of Health and Human Services projects that demand for intensivists will continue to be greater than available supply in the next three decades.

The Leapfrog group, a large coalition of employers that sets safety and quality standards, in 2000 included round-the-clock intensivist staffing as one of three standards it uses to determine where employees should go for hospital care. But with only 31% of hospitals able to meet the criteria, the group says remote monitoring is one way to shift the balance. While an intensivist working in a hospital may oversee 10 patient beds, one doctor and four nurses in a remote command center can oversee the care of 75 to 100 patients.

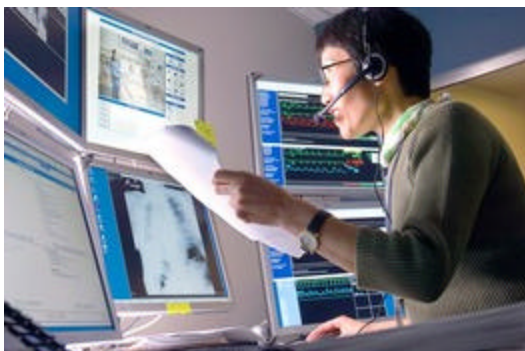
The leading provider of such systems, 11-year-old Visicu, was acquired last year by electronics giant Philips Electronics NV, and says that it now supplies the technology to 42 health systems covering 5,900 beds—about 10% of the nation's ICU beds. The systems cost \$4 million to \$5 million on average to install, and can cost \$2 million more annually to staff and maintain. But

hospitals that have used the systems say they soon pay for themselves in reduced costs, mortality and length of stay in the ICU. While they are especially useful in smaller communities and rural areas where about 35% of America's hospitals are located, they have also been shown to improve care and reduce mortality in large urban academic medical centers, where the remote doctors using monitoring programs can catch things that may be missed even by a trained eye in a well-staffed ICU.

Fast Response

"From a remote center, doctors are able to respond to computer-based alerts [and] identify when a patient is beginning to get into trouble, as opposed to when they are already in trouble," says Brian Rosenfeld, chief medical officer of Baltimore-based Philips Visicu and one of the two former Johns Hopkins University intensivists who developed the system. For example, the software can identify when a patient's heart rate is too high for a particular condition, which a doctor or nurse at the bedside might not immediately recognize. And the software can identify signs of a deadly infection such as sepsis in a patient before the symptoms might be obvious. In addition to monitoring patient conditions, an eICU system triggers reminders when, for example, a central line has been left in a patient for more than 96 hours and needs to be removed to prevent infection.

At the University of Massachusetts Medical Center, a study of 6,400 patients in seven adult intensive-care units monitored by eICU showed substantial benefits in reducing both costs and mortality, according to the hospital's director, Craig Lilly. After the costs of the system were factored in, the hospital was able to save \$5,000 per case, Dr. Lilly says, in large part because the system enabled intensivists in the remote command center to "detect instability and bring new treatment to the patient before they would have received it in a regular ICU." Over a six-month period, there were more than 30,000 interventions in the ICU, 24,000 of them involving a changed treatment plan or new diagnosis. Dr. Lilly says 199 of the interventions were made at the request or suggestion of the offsite monitoring team for every one made at the request of the bedside team.



An eICU clinical operations room at Inova Health System in Falls Church, Va., is equipped with two-way audio and video

Dr. Lilly is now working on a study of the benefits of remote monitoring for community hospitals, with funding from the New England Healthcare Institute, based in Cambridge, Mass. "The brilliance isn't the technology, but the fact that we can use the technology to help physicians practice evidence-based medicine," says Wendy Everett, president of the nonprofit group. But Ms. Everett says there is still resistance to the idea of remote monitoring; medical directors at some large hospitals her group interviewed said they weren't considering the technology

because they didn't think there was any room for improvement in their ICUs. And intensivists who have worked with the systems say they can't be effective unless those at the bedside are willing to take direction from the remote monitors and work as a team, which isn't always the case.

Convert in Florida

James Shaffer, medical director of the eICU at Health First in Florida, says at first he resisted the idea of using the technology, because he worried it would "rob the human element of care." But with the hospital group growing rapidly and adding a fourth hospital, it didn't have the staff to cover its existing six intensive-care units adequately, especially at night, Dr. Shaffer says. Now, he and other intensivists alternate bedside care with night-shift duty in the eICU.

"I feel so gratified when I walk out of a night there—it's like a giant pinball machine that lets me stomp out all these fires," Dr. Shaffer says. "I'm not just one guy trying to be too many places at once."

In addition to cutting costs, hospitals say the eICU can actually help them increase revenue. Since St. Mary's Hospital in Jefferson City, Mo., began outsourcing electronic monitoring of its ICU to St. Louis-based Advanced ICU Care, shorter lengths of stay have allowed St. Mary's to take on more patients in the ICU, and increase its revenue by \$1.2 million in the first two years.

Sioux Falls, S.D.-based Avera Health System uses its eICU system to cover 72 intensive-care beds in 18 hospitals spread over a five-state region, some as many as 350 miles apart. Prior to using the system, it had just two hospitals with intensivists. "Now we are able to put a virtual nurse and intensivist at every bedside in our system, continually," says Chief Quality Officer David Kapaska. In addition to catching warnings that otherwise might go unheeded, intensivists can quickly determine if a procedure such as placing a central line must be performed, then mobilize hospital staff on site and move on to the next patient issue. "You can't physically be in all those places at once but you can know what is going on in all of them at the same time," says Dr. Kapaska.

Saving Lives and Money

At Avera hospitals, ICU mortality has been 65% to 80% lower than predicted by a ratings scale used to measure how well patients will fare once they arrive in the unit; before the eICU was adopted, the average rating for the group was 50% lower than the predicted rate. That has translated into about 400 lives saved, according to Ed Zawada, the eICU medical director for Avera. The system has also enabled smaller hospitals to keep sicker patients instead of transporting them to bigger medical centers.

In a study comparing results before and 30 months after implementation of the system, rural hospitals in the network estimated a 37.5% reduction in the number of patients requiring transfer to a larger hospital, saving more than \$1.2 million; reduced length of stay in the ICU saved an estimated \$8 million, the study showed.

Janet Doom, a 74-year-old patient recovering from heart surgery, was being transferred from a smaller Avera hospital to the group's main McKennan Hospital in Sioux Falls, after she began to feel ill. But a blizzard hit, making the roads impassable, so she had to be admitted to a small rural medical center operated by Avera. Monitored for three days by the staff in the eICU, she recalls overhearing the conversations about her care.

"They knew everything, including my heart rate, my pulse, and how much pain I was in," says Ms. Doom. "When you need something like that, it's nice to know it's there."

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