St. Vincent’s Hospital deployed a patient-tracking and real-time clinical information system that improved the quality of care, increased revenues and delivered an ROI.

By Jill Gambon

Aug. 28, 2006—When nurses at St. Vincent's Hospital in Birmingham, Ala., want to know if a patient has returned from having lab tests, they no longer need to walk to that person's room to check. They can simply look at a large, flat-panel screen hanging over the nurse's station, where an icon indicates the patient's location. The screen's color-coded graphics also tell them when lab results are ready and whether immediate attention is required.

Such patient-tracking and real-time clinical information is possible because of a system combining RFID technology and data from the hospital's various health-information programs. Nearly two years old, the system has helped the hospital improve capacity management and enhance the quality of its care.

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St. Vincent's is part of Ascension Health Corp., the country's largest nonprofit health-care system, with 67 acute-care hospitals in 20 states. Each year, St. Vincent's serves more than 17,000 inpatients and 125,000 outpatients. And the number of patients is growing—from March to December 2005, admissions jumped by 19 percent. But St. Vincent's, which has 338 beds, lacked up-to-the-minute information about the availability of the beds. As a result, patients had to be diverted to other hospitals. In 2004, St. Vincent's lost an estimated $20 million in net revenue because of such patient diversions.

To address this problem, the hospital developed a strategy to improve patient visibility, eliminate backups in admissions and discharges, and reduce the time spent waiting for care. A first step in
reaching those goals was getting better insight into where patients were at all times, as well as making available real-time information about the status of doctors’ orders and test results.

While the hospital was looking at how to make those improvements, it was also exploring ways to incorporate RFID into its infrastructure. "As RFID was coming over the horizon, it piqued people's interest," says Stettheimer, who also serves as a regional CIO for Ascension Health. "We felt there was value there." St. Vincent's has earned a reputation for embracing emerging technologies, including an expansive wireless LAN covering more than 1 million square feet, and a computerized physician order-entry system that aims to improve patient safety and boost the quality of care. After reading about the use of RFID by such early adopters as Wal-Mart and the U.S. Department of Defense, Stettheimer was convinced the technology held promise for the hospital.

To that end, St. Vincent's hired Awarix, a Birmingham-based software company, to help design a plan to improve the flow of patients throughout the hospital. It also worked with Intel to develop the real-time patient visibility system. The system uses active RFID tags, interrogators (readers) and software from Radianse, and it runs on Intel-based servers. The hospital considered using Wi-Fi for patient-tracking, but ruled out that technology because the tags were too big and the battery life too short.

Development work began in January 2004, and a pilot project was launched the following September in the 34-bed cardiac-care unit. The tags were attached to the patients’ charts, which accompany them wherever they go in the hospital. The egg-shaped tags are slightly bigger than a key fob used to unlock a car, says John Pantano, vice president of marketing for Radianse. The system operates at 433.9 MHZ and reads the tags every 10 seconds.

The RFID interrogators, wired into the hospital's Ethernet network, send information about the patient’s location to an SQL Server database. Any location changes the interrogators detect are written to the database, then displayed in real-time on screens installed throughout the hospital. To protect privacy, no names are displayed on the screens—only room numbers identify the patients.
In addition to the patient-location information, the system integrates clinical data and relevant information, such as notification of lab results, prescription orders and other medical instructions. The system conveys this information on screens through a series of color-coded graphics and icons, allowing nurses to tell at a glance what care a patient requires. Before the system was in place, nurses had to log on to the computer to look up lab results and check physician orders. This resulted in a time lag between when orders were entered into the system and when a nurse logged in and read them.

One of the biggest challenges in developing the system was trying to figure out what information should be displayed on the boards, says Theresa Meadows, director of clinical systems for St. Vincent's. The hospital collects huge amounts of data, but in many cases, that information wasn't readily available to the staff. This meant nurses and administrators couldn't see where problems were occurring and, thus, could not shift resources or move patients to resolve back-ups. Sometimes, it could take three months to mine the data to see why bottlenecks occurred. Now the staff can tell, by looking at the screens, if there is a backlog of patients waiting for X-rays. If another X-ray machine is available somewhere else in the hospital, the staff can redirect the patients to it.
The system has helped free up beds for new patients. It used to take six hours, on average, to log discharged patients out of the hospital’s computer system. That meant nurses, bed controllers or other staff would not know immediately if a patient was sent home. Secretaries on each nursing unit would walk around and check to see which patients were gone. As a result, vacant rooms often sat unused, even when other patients were waiting for them. "We’d have beds open, and we just didn't know it," Meadows says. Now, with discharge orders displayed immediately on the screens, it takes no more than six minutes to move patients out of the hospital’s computer system, and to have the rooms cleaned and prepared for the next occupants.

"The biggest process change is being more diligent and more aggressive when a patient is ready to go home,” says Kay Buchwald, a registered nurse and systems project lead at St. Vincent's. "It increases our awareness of the discharge process."

According to Buchwald, nurses readily accepted the patient-location system, in large part because it is so easy to use. "We didn't have any push-back with the system," she says. "They didn't think we were asking them to learn a new tool." Since there is no data entry, the only training required was a 15-minute orientation conducted right in the nursing unit. Posted near every screen are legends explaining the icons and color codes.

Within six months of the pilot rollout, the system was introduced throughout the hospital except for the maternity ward, where staff members had reservations about the aesthetics of the display screens in rooms designed to evoke a feeling of hominess. But that resistance has been overcome, and the system is now being installed in the maternity ward. Outpatients who visit the hospital's diagnostic center are also being tracked with the Radianse tags, which are clipped on to their clothing. This allows the staff to monitor the flow of patients and take action if any backups or bottlenecks occur.
St. Vincent's has about 140 interrogators and slightly fewer than 500 tags, Pantano says. The hospital has room-level coverage in several of its labs and zone-level coverage in the nursing units. Therefore, patient location is pinpointed within a range of four to six rooms.

The entire project cost an estimated $1.7 million, including the PCs, software, RFID tags, interrogators, installation and integration, and it quickly reaped results. The number of patients discharged by noon—a key measure of operational efficiency for the hospital—climbed from about 20 percent to about 40 percent. Moreover, Meadows says, fewer patients are being turned away for lack of beds: Patient diversions dropped by 25 percent in the critical-care unit and 60 percent among medical-surgical beds.

The hospital estimates that it was able to serve more patients using the RFID system, for a net revenue increase of $2.58 million during the pilot phase. And the revenue gains have continued, with the hospital taking in an additional $5.5 million between March and July 2005. The 12-month ROI for the project was 151 percent, according to the hospital.

While the reviews of the project are universally positive, there have been occasional bumps. At times, the access points required fine-tuning, with RFID readings "bleeding through" from one floor to another. "We've addressed that," Buchwald says.
As hospitals come to understand the value of patient visibility and the relatively quick payback of RFID systems, more will embrace the technology, predicts Joseph Dalton, senior technologist with Intel's Innovation Centre. "RFID has the ability to transform unstructured, chaotic business processes," says Dalton, who has developed models for using RFID in health care. According to Stettheimer, Ascension Health is now looking to expand the use of RFID to some of its other hospitals and plans to deploy the Awarix-Radianse system at its Middle Tennessee Medical Center in Murfreesboro.

St. Vincent's has plans to test a wireless asset-tracking project for its medical equipment in July, but it will use Wi-Fi instead of RFID to leverage its investment in the wireless LAN. In addition, the pilot will provide an idea of which technology—RFID or Wi-Fi—best suits its needs for different applications.

But Stettheimer says technology alone won't improve the hospital's bottom line. Better processes and training, he maintains, will determine how much the technology helps: "If you just jump at a technology and don't change your processes, you don't gain much value. Processes and technology have to be linked together."