

The hospital's new RFID system uses active UHF RFID tags to track about 1,300 medical devices.

By Beth Bacheldor

April 3, 2007—[Wayne Memorial Hospital](#) has saved more than \$300,000 in expenses, thanks to a new RFID system it uses to track about 1,000 medical devices throughout the hospital.

The Goldsboro, N.C., hospital is using an RFID-based real-time location system (RTLS) from [RadarFind](#) to keep tabs on infusion pumps, diagnostics machines, blood warmers, computers on wheels, wheelchairs and other equipment. Wayne Memorial first installed a beta version of the system in the spring of 2006, and went live with a full-scale implementation in November.

Wayne Memorial wasn't necessarily looking for an equipment-tracking system when RadarFind met with hospital officials more than a year ago. Still, says Tom Bradshaw, the hospital's COO, RadarFind's system made sense. "I had an appreciation for it," he says, "because at our hospital, we did often have trouble locating equipment, particularly in order to perform maintenance and inspections." In fact, when Bradshaw's son was a patient at the hospital, Bradshaw checked the infusion pump's tag and discovered its inspection had expired. At the time, Bradshaw was paying more attention to his son's recovery, so he waited until his son was discharged before visiting the manager of the hospital's clinical engineering department, which maintains, inspects and repairs all the electronic medical equipment. "I went to the department manager," Bradshaw recalls, "and his response was, 'You found it. I have been looking for that pump for months.'"

Now, with several months' experience using the RTLS system, Wayne Memorial will likely exceed the 1,000 tags it currently uses. "We are getting more and more requests," Bradshaw says, "particularly from the nurses who want us to tag more equipment."

The system leverages RadarFind's active UHF RFID transponders, which operate at 902 to 928 MHz and use multiple-input, multiple-output (MIMO) communication. MIMO is a wireless communication technique utilizing multiple analog signal paths among multiple antennas at both the transmitter and receiver to transmit data. The RadarFind asset tags include unique ID numbers and also feature switches for nurses to trigger, indicating whether an asset is in use, needs cleaning or is ready for use. A specially designed asset tag for wheelchairs can also use electric-field sensing capabilities to determine if a patient is in a wheelchair.

RadarFind executives say the tags have a battery lifespan of about seven or eight years. They communicate with readers that typically get plugged into standard AC outlets in patient rooms or other areas hospitals want to monitor.

The readers pass along the data collected from the tags to collectors, which manage multiple readers, explains Stephen Jackson, RadarFind's CTO and one of three company founders, alongside CFO and COO Bobby Bahram, and chief medical officer Vincent N. Carrasco. The readers can communicate to

the collectors—RadarFind suggests installing one collector per floor—using either the 902-928 MHz band or the hospital's power lines, by sending special data signals over the power wiring. The collectors then pass the data, via a local area network, onto a RadarFind server.

RadarFind has opted not to employ tags and readers using the 802.11 Wi-Fi 2.4 GHz communications protocol, which a number of other RTLS providers are currently leveraging. The company says this is because hospitals need to reserve their Wi-Fi networks for other applications.

"We spent an enormous amount of time really looking at what hospitals need, looking at the type of technologies, type of frequencies and even how hospitals will evolve in the future," Carrasco says. "I would not take lightly the fact that we are purposely avoiding the 802.11 approach because of the data needs of hospitals. The potential of using a locating or tracking system that leverages 802.11 is that these systems can actually disrupt other systems because of the load of tracking data is going to increase."

In a typical installation, each patient's room will have one interrogator. The read range for each reader is programmable, Jackson says, from about 3 feet to about 150 feet, Jackson says. In a larger area, such as a cafeteria, a hospital could decide to break the area into zones, then place readers corresponding to the number of zones. For example, a cafeteria could be broken into four quadrants and, thus, have four readers.

"The system is modeled in very much the same way that aircraft are tracked," Jackson says. "At commercial airports, there is a big antenna that spins around to monitor where aircraft are. The antenna sends out a signal as it spins around, and as the signal hits the airplane, there's a box in the airplane and that box responds, 'I'm aircraft such and such; I'm flying at this air speed, at this elevation.' Instead of one big gigantic reader, we have hundreds of these that are electronically scanning the room."

According to Jackson, conventional RFID technology has range and positioning inaccuracy because passive tags have to be too close to readers, and because active tags can't be differentiated in close quarters. However, he claims, MIMO technology solves the problem of trying to determine the locations of multiple active tags in close quarters. "By building a system that has many synchronized reader antennas (multiple inputs) and collecting this information-rich data stream (multiple outputs)," he says, "you can use the laws of physics to get the answers you are looking for."

Caregivers can access all the data culled from the tags via a software program to locate and determine the status of a variety of equipment. "One of the issues we know," says Terry Kane, RadarFind's CEO, "is that for a vast majority of people in hospitals, they aren't very computer-savvy. This software was developed with that in mind, and features a touch-screen interface. It is very user-friendly." The software also features color coding and simple map views, as well as sophisticated reporting functions that caregivers and administrators can use to track maintenance, trend equipment utilization and ultimately make better planning and budgeting decisions.

Those reporting features have enabled Wayne Memorial to save about \$303,000 on infusion pumps. The hospital studied its infusion pump utilization during the two-month period between February and March, and found it was using only about 50 to 60 percent of all its infusion pumps throughout the hospital. "We tracked the utilization pumps because Wayne is going to replace all the pumps in May of this year," Kane says. Once the hospital determined it wasn't fully utilizing all the infusion pumps it had on hand, it decided to order fewer replacements. Instead of the more than 300 pumps it initially planned to buy, it now will purchase only about 250 pumps. This will save it nearly \$276,000, plus an additional \$27,000 in operating costs for those added pumps. "That roughly saved them \$303,000," Kane notes, "and that is more than it costs to install the system."

The RFID-based RTLS is also saving the hospital time. Before Wayne installed the RadarFind system, whenever a caregiver called for a wheelchair, it typically took about 20 minutes for it to arrive. Now that the wheelchairs are tagged, the wait time is usually somewhere between two and five minutes.

In addition, the hospital has drastically cut the time it takes to inventory all its wheelchairs. Instead of spending an entire day, once a month, looking for and collecting all the wheelchairs the hospital has, Bradshaw says, the task can now be done anytime and takes just minutes.

This translates to the patients being a lot happier," says Carrasco. "When you can deliver better care in a timely manner with patient safety in mind, the quality of care goes up. And that is the goal of Wayne Memorial."