

The 4.1-million-square-foot hospital is deploying hybrid infrared-RFID technology to monitor vaccine temperatures, while future plans include tracking assets, patients, employees and hand hygiene.

By Claire Swedberg

July 21, 2009—[Wake Forest University Baptist Medical Center](#) (WFUBMC) has begun an ambitious wireless deployment that will ultimately include tracking patients, staff members and assets throughout its 4.1-million-square-foot facility, but is initially focused on tracking temperatures within its 300 refrigerators and freezers.

The size of the medical center makes this the largest health-care tracking deployment, according to technology vendors implementing the system. [Patient Care Technology Systems](#) (PCTS) is implementing its Amelior Tracker software application in conjunction with the InTouchCare real-time locating system (RTLS) from Newton, Pa., health-care tracking technologies company [CenTrak](#). The InTouchCare system employs infrared transmitters and sensors to determine the room-level location of its 900 MHz RFID tags.



*Robert Parker,
WFUBMC's VP for home
and community health*

WFUBMC, with 1,056 beds, provides health-care services to the Winston-Salem, N.C., area. Approximately three years ago, the hospital began looking into asset tracking for its infusion pumps, wheelchairs and other higher-value mobile equipment. "Our inventory has been growing, year in and year out," says Robert Parker, WFUBMC's VP for home and community health.

If assets could not be located, because they had either been removed from the facility or simply not stored where they should have been, additional equipment would have to be ordered. WFUBMC sought a solution that would help track assets, and have the flexibility to add features to the tracking infrastructure as time went on. The hospital initially tried an RTLS that utilized Wi-Fi-based RFID tags, but that system was unable to identify an asset's location to a specific room.

"We saw pitfalls associated with Wi-Fi and ZigBee," Parker says—namely, the lack of granularity in pinpointing an asset's location. The hospital also investigated ultrasound solutions, though it found no such system that was wireless and, thus, easy to install.

In March 2009, the [Center for Disease Control and Prevention's Advisory Committee on Immunization Practices](#) established a new guideline recommending that hospitals track the temperatures of vaccines twice daily, which would prove to be a labor-intensive task. For that reason, WFUBMC looked to the InTouchCare system to provide temperature monitoring, as well as asset tracking.

Approximately nine months ago, WFUBMC began testing the Amelior Tracker application with

InTouchCare technology. On several floors of its facility, the hospital installed temperature-sensing InTouchCare tags in refrigerators, as well as attaching InTouchCare asset-tracking tags to mobile equipment. The sensors attach to the exterior of each refrigerator or freezer, with a temperature probe placed within. The pilot has led to a deployment that began early this month. By February 2010, when the hospital has completed a project to replace its existing infusion pumps with a newer model, it intends to begin tagging the new pumps, as well as other assets, beginning with 4,000 tags. In the meantime, PCTS is also installing about 1,300 infrared transmitters—one per room—and several hundred RFID antennas throughout the facility.

With the hybrid system, each infrared transmitter emits an infrared signal encoded with the number of the room in which it is installed. That signal is received by all of the tags in that room, using what CenTrak calls "Gen 2IR," which does not require a line of sight—a tag underneath a blanket, for instance, is still able to receive an IR emission. Each tag, in turn, transmits a 900 MHz RF signal encoded with the room number, as well as its own unique ID number, to RFID antennas linked to an RFID interrogator on each floor. The reader, according to Wil Lukens, CenTrak's VP of business development, uses InTouchCare middleware to send data from all tags on the floor to PCTS' Amelior Enterprise Visibility Suite software running on a back-end server via the hospital's Wi-Fi network. Because the RFID tags are powered by batteries, he says, they have a long read range, thus enabling a single reader antenna to cover an area of 10,000 square feet.

In some cases, the hospital is setting up virtual walls, with an IR transmitter emitting several infrared signals that differ according to which side of the room in which they are emitted. In this way, tags capture only certain infrared emissions in particular areas of the room, indicating just which portion of a room the tag is in. The benefit of infrared, Lukens says, is the pinpointing of a location within a specific room or portion of a room, which RFID alone could not do, in part because RFID transmissions leak into neighboring rooms.

A tag attached to a refrigerator or freezer transmits signals encoded with its ID number and location, as well as the date, time and temperature, as measured by its built-in sensor. If the temperature fluctuates beyond the established safe threshold, the Amelior system can issue an alert to predetermined parties via text messages, e-mails or pages. The Amelior system also stores the results of temperature readings and provides data to the hospital regarding the history of temperature fluctuations in any refrigerator in which medications are being tracked, says Stephen Armstrong, PCTS' VP of marketing. Amelior provides a tag's location on a map of the hospital floors, as well as temperature data in the case of refrigeration and freezer temperature tracking. It also provides such search options as searching for items on a selected floor or within a selected department, or simply all of a specific piece of equipment. Amelior can also send alerts, such as when the system can no longer read transmissions of a tagged asset.

PCTS signed a partnership agreement with CenTrak in early 2009, Armstrong says, but this is the two companies' first deployment. "We think CenTrak's technology is very robust," he states. "We like the fact that the hardware is battery-powered, which simplifies the installations. It makes this a very simple,

easily configured system."

The system's pilot was designed to ensure that the infrared transmissions did not leak from one floor to the next. "That's one of the things that built confidence [for WFUBMC]—they saw the ease of integration," Lukens says, pointing out that the IR transmitters are battery-operated (the battery's life is approximately five years) and therefore do not require the installation of power wires, and that the readers can use the hospital's existing Wi-Fi system to transmit the information they receive from the tags. The interrogators will be plugged into ordinary power outlets, though alternatively, they could use power-over-Ethernet.

This year, the hospital also intends to test a hand hygiene system using PCTS and CenTrak technology to track whether employees wash their hands before visiting a patient. In this case, physicians will wear an RFID badge that will send data to an antenna on the soap or alcohol dispenser when that dispenser lever is pressed. The badge's unique ID number will be linked to the individual's name, stored on the server, thus indicating when and where that person washed his or her hands. The details of that pilot are still being developed, Parker notes.

With the entire system, Parker says, he hopes WFUBMC will improve its vaccine refrigeration records system, by enabling the facility to monitor temperatures automatically instead of manually, as well as make tracking assets more efficient by reducing the man hours spent searching for missing items, reduce the incidence of duplicate ordering of assets that have gone missing, and track patient flow once patients are wearing infrared-RFID tags, "The list goes on and on," he says. Most immediately, he adds, "our goal is to be able to manage the data that results from that technology, and use the data to our benefit."