

TESTING GIVES WAY TO IMPLEMENTATION

Hospitals tune in to RFID

As the RFID revolution marches on in industries such as manufacturing and retail, most hospitals are still sitting on the sidelines, waiting for the technology to develop and for prices to perhaps inch downward. Industry representatives estimate that only about 200 hospitals are using this radio wave-based technology, chiefly for tracking equipment or patients. Most of the early users have limited their RFID (radio frequency identification) applications to emergency departments, operating rooms or small pilot programs on one floor.

“There’s a lot of toe-dipping going on,” says Gregg Malkary, managing director of Spyglass Consulting, Menlo Park, Calif. In interviews Spyglass conducted last year, health care organizations indicated that “current-generation RFID solutions are not ready for large-scale, enterprisewide deployments,” he says.

But consultants and their hospital clients, presented in case studies later in this article, report that as a tracking technology, at least, RFID is reaching maturity. They say it is easy-to-use, staff members seem to be universally grateful for this time-saving technology and it produces

real savings. The list of RFID vendors is getting lengthy (see chart, p. 20) and there are signs that hospitals are more interested in these systems. Some vendors report an increase in facilitywide installations. And a recent survey conducted by BearingPoint, Mclean, Va., and the National Alliance for Health Information Technology, Chicago, showed that almost three-quarters of health care organizations expect to invest in this new field in the next two years. RFID uses signals from specific radio frequencies. In addition, other systems based on Wi-Fi signals, infrared and ultrasound provide tracking technology that closely resembles RFID.

The way traditional RFID works is simple. A small tag on a device or person emits a radio wave that is detected by a network of receivers around the hospital. Software crunches the positioning data and puts the locations on a map or table or into a hospital information system.

The No. 1 barrier to acquiring this new technology, experts say, is price. Quotes from various vendors indicate that it costs \$200,000 to \$600,000 or more to install a facilitywide RFID tracking system in a medium-sized hospital.

But vendors are quick to say that the new efficiencies RFID systems produce can pay for the investment in one to two years, and many hospital clients agree.





Michael Hayes, director of logistics, the Medical Center of Plano, Texas, uses RFID tracking software not only to improve inventory processes, but also to help health care workers find equipment when they need it.

Photo by Don Netzer

This is because RFID-based tracking eliminates staff time spent searching for equipment, and inventories can be slashed because equipment does not get lost. Similarly, RFID-based patient tracking can speed up patient flow in high-volume areas such as the ED and OR, increasing income and eliminating the need for costly capital expansions.

Many of the early users are sprawling

institutions where keeping track of equipment and patients is a real challenge. But plenty of smaller hospitals in the 250- to 400-room range also are acquiring RFID.

There are ways to bring down the cost. For example, a big chunk of RFID's cost is installing a network of receivers. Many hospitals try to reduce this cost by piggybacking a tracking system onto an existing Wi-Fi network, but Malkary and oth-

ers caution that this requires installing extra Wi-Fi receivers, reducing potential savings, and the signal may not be as precise as true RFID.

Some hospitals have avoided building an expensive infrastructure altogether by using handheld RFID trackers, but that means staff still has to walk around with these devices, chasing equipment. And the hospital still has to pay from \$50 to \$100 each for active RFID tags. Passive RFID tags, on the other hand, cost 50 cents or less and can be as small as a grain of rice, but because they can be read only within a foot or two of the tag, they have entirely different uses. For example, RF Surgical Systems, Bellevue, Wash., puts passive tags in surgical sponges that emit a signal to help prevent them from being left in patients.

Some RFID systems are still in development. For example, passive tags may eventually replace bar coding on supply shipments to the hospital, says George Magee, program manager for an RFID project at Defense Medical Logistics Standard Support (DMLSS), Falls Church, Va., a medical technology program in the U.S. Department of Defense.

Packages with passive tags could be put on a conveyor belt and read by a scanner, but not quite yet, he says. DMLSS tests showed a 67 percent reading accuracy of the tags, but a new generation of passive tags is expected to have an almost perfect accuracy rate, Magee says.

Lawson Software, St. Paul, Minn., maker of barcoding technologies for tracking surgical instruments in trays, noted in a recent release that replacing bar codes with passive RFID tags would make the process more efficient. However, Lawson has not announced any plans for such a product.

Meanwhile, hospitals are moving ahead with more dependable uses of RFID.

Sampling of RFID vendors that cater to the health care industry

3M (www.3m.com/rfid): RFID provider that recently entered health care

AeroScout (www.aeroscout.com): Wi-Fi-based tracking for several industries, including health care

Agility Healthcare Solutions (www.agilityhealthcare.com): Installs network, provides tags and software

Awarix (www.awarix.com): Organizes tracking data onto whiteboards for viewing

Cisco Systems Inc. (www.cisco.com): RFID hardware for many industries

Ekahau Inc. (www.ekahau.com): Wi-Fi-based inventory system for many industries

InfoLogix (www.infologixsys.com): Wi-Fi- and RFID-based software for asset and patient tracking

InnerWireless (www.innerwireless.com): Installs Wi-Fi and RFID systems in hospitals

Intel Solution Services (www.intel.com): Customizes RFID software for hospitals

Lawson Software (www.lawson.com): RFID software across several industries

Mobile Aspects (www.mobileaspects.com): Cabinet-based RFID system using passive tags

Parco Wireless Corp. (www.parcowireless.com): Ultra-wideband RFID

Patient Care Technology Systems (www.pcts.com): Tracking software

Precision Dynamics Corp. (www.pdcorp.com): RFID wristbands

Radianse Inc. (www.radianse.com): Tracking hardware and software

RadiantWave (www.radiantwave.com): Helps set up asset tracking systems

RedPrairie (www.redprairie.com): Software to support RFID, other tracking equipment

RF Surgical Systems (www.rfsurg.com): Passive tags to detect surgical objects not removed from patients during surgery

RF Technologies (www.rft.com): RFID to locate devices and patients

SAP America (www.sap.com): Passive RFID system to track medications in a hospital

Siemens Business Services (www.it-solutions.usa.siemens.com): RFID wristbands for patients

Sonitor Technologies (www.sonitor.com): Ultrasound-based tracking for room-level detection

PanGo Networks (www.pango.com): Combines Wi-Fi tags with software

McKesson Provider Technologies (www.mckesson.com): Software, hardware and automation solutions

Texas Instruments (www.ti.com): RFID tags and receivers across many industries

Verichip Corp. (www.verichipcorp.com): Human-implantable RFID microchips with medical history

Versus Technology Inc. (www.versustech.com): RFID and infrared tracking

Wavemark (www.wavemark.net): RFID tracking technology

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▼ EQUIPMENT WHEN THEY NEED IT

Since a hospitalwide tracking system was implemented at 285-bed Medical Center of Plano, Texas, 1,200 pieces of mobile equipment have been tagged and the goal is 3,000 pieces.

"Every week we find something new to tag," says Michael Hayes, director of logistics at the hospital, which is part of HCA, Nashville. Infusion pumps, mobile EKGs, pacemakers, and even computers on wheels have been tagged.

He reports that other HCA hospitals are interested in installing the system, and staff at his hospital are pleased. "There is a cultural change going on," Hayes says. "People are becoming more confident that equipment will be there for them."

Hayes started his search for a system in 2003. He looked at nine vendors with a variety of technologies, even passive RFID tags rigged for detection when coming through doorways. He says it took 30 months to choose a vendor, partly due to unfamiliarity with a rapidly changing industry. Agility Healthcare Solutions, Glen Allen, Va., was chosen because it "focused on health care and had a robust, comprehensive product," Hayes says.

In an RFID industry that is still fragmented among many vendors offering different parts of the package—tags, networks, software and support—Agility can line up all the other vendors and present a complete package, says Dan Neuwirth, an Agility spokesman.

The biggest mistake hospitals make when selecting RFID, Neuwirth says, is not pinning down exactly how they want to use it. Typically, hospitals "implement huge RFPs and want to know everything under the sun, but they don't link it to a specific use."

Neuwirth says hospitals also need to understand that switching to RFID has an effect on workflow. With RFID-based patient tracking, for example, staff switch

from writing patient locations on whiteboards to viewing the information on an LCD display screen. And when they have finished using an IV pump, rather than leaving it out in the hall, they must put it into a "dirty" room so that the system can identify it as such, he says.

Hayes estimates it will take 15 months for his hospital to make a return on the investment, mainly through reductions in inventory. For example, he says a contract he recently signed for sequential compression devices assumes a 14 percent reduction in inventory.—L.P.



At the Medical Center of Plano, Texas, items such as IV pumps are tagged to control inventory and to ensure that health care workers can easily locate equipment.

Photo by Don Netzer



▼ NO MORE HIDE AND SEEK

Missing equipment has been an unsolved problem at 546-bed Harrisburg (Pa.) Hospital for decades, says George Morley, director of biomedical engineering at PinnacleHealth, the hospital's parent.

"We tried a whole host of solutions, but they didn't work," he says. "People were constantly losing things. If equipment was missing in one unit, someone would borrow it from another unit."

When a board member twice complained that there was no wheelchair for arriving patients, "that's when we got rolling" with RFID, he recalls.

Since the hospital already had a Wi-Fi network, Morley considered using it for a Wi-Fi-based tracking system, but he determined that a Wi-Fi-based system would require frequent calibration and the signal would not be as good as RFID.

The hospital ended up choosing RFID technology from Radianse Inc., Lawrence, Mass., and the company installed a facilitywide system for equipment tracking in May 2006.

Morley says he did not pursue room-level accuracy for most of the facility because it would be more costly.

On patient floors, the signal is accurate down to four patient rooms, which gives staff enough of an idea to find large pieces of mobile equipment such as wheelchairs or gurneys.

It has greater accuracy in places such as laundry chutes, so that devices caught in bed linens can be detected. "Once a \$3,500 piece of equipment goes through the laundry, it never works the same again," he quips.

Even though active tags are expensive, "we're tagging everything," he says. He even tags walkers and 50-cent keys to PCA pumps. "It's not the cost of items," he says, "it's the time associated with finding these things."

Because tracking leads to lower inventories, the hospital predicts that the system will pay for itself within two years.

While most hospitals still prefer limiting RFID to pilots in specific areas, Mike Dempsey, chief technology officer at Radianse, says more customers are leaning toward facilitywide installations like Harrisburg Hospital's.

The company reports that it completed five to six hospitalwide installations in the last four months of 2006.

Dempsey says the advantages of hospitalwide installations are clear.

"When you have a pilot operating in only in 10 percent of the hospital, you are not going to find an infusion pump if it is anywhere else," he says.—LP



George Morley, director of biomedical engineering, PinnacleHealth, Harrisburg, Pa., instituted RFID to ensure incoming patients had wheelchairs; but the tracking system is now used for other purposes as well. Color-coded tags are used to differentiate items such as movable equipment that can easily be taken from the hospital.

Photo by Zbigniew Huber

▼ UPDATING OLD OR SYSTEMS

Providence St. Vincent Medical Center, Portland, Ore., was an early adopter of tracking technology, installing an infrared-based system to track equipment in perioperative areas in 2002 and extending it to track their patients the next year.

"Now infrared is old technology," says Deborah Bahlman, R.N., regional manager of surgery information systems at Providence Health System in Oregon.

The vendor, Patient Care Technology Systems (PCTS), Mission Viejo, Calif., now installs mainly RFID-based systems and Bahlman says she is working on installing RFID in the surgery department of one of the other Providence hospitals in Portland. Though infrared uses light, it works much like RFID. About 130 infrared sensors are in prep rooms, ORs and recovery rooms, hallways and the waiting room. Equipment and patients wear badges (see inset photo to above) emitting infrared signals that are picked up by the sensors. But unlike RFID signals, the badges have to be in the line of sight of the sensors to be read. "It works great as long as you keep your badges uncovered," Bahlman says.

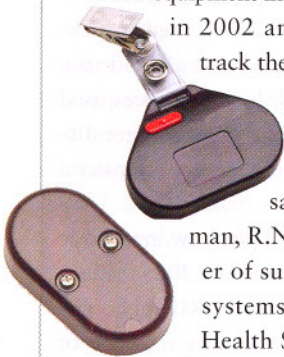
The infrared tracking system is integrated with nurse call buttons on the wall of each room, which staff press to indicate when a patient is ready for the next step in the process. PCTS software then alerts a nurse and puts patient information onto an electronic whiteboard.

Bahlman says staff who trained on the system for one hour were so eager that they started using it two weeks before scheduled, and they have been happy with it ever since. The system accelerated patient flow and eliminated phone calls

to track patients, which averaged 11 calls per patient, producing a quieter environment. With patient location and status instantly displayed on the electronic whiteboard, "everybody's in the know," she says. PCTS provides software that collects tracking data from a variety of sources "to get as much information in front of the caregiver in real time, with as little manual entry as possible," says

Stephen Armstrong, the company's vice president for marketing.

In addition to providing tracking software, he says the company will work with other vendors to provide hardware, install the system, set up interfaces, train staff and provide support. Armstrong says PCTS can also install ultra-wideband RFID, a recent development that improves tracking accuracy to a foot or less.—L.P.



(TOP) Deborah Bahlman, R.N., regional manager of surgery information systems, Providence Health System in Oregon, stands beneath LCD monitors displaying real-time status of patients being prepped for surgery. (TOP RIGHT) A surgeon checks the screens located in the OR to determine patient location, patient status or operating room status. (BOTTOM RIGHT) Patients are given a wristband that allows their progress throughout the surgical prepping phase to be monitored.



Photos courtesy of Providence Health System



▼ DEPLOYING RFID IN THE CATH LAB

While active RFID can be used to track mobile equipment throughout a facility, 816-bed Carolinas Medical Center, Charlotte, N.C., uses passive RFID, which tracks tags just a foot or two away from the scanner.

The hospital's new system, iRISupply,

made by Mobile Aspects, Pittsburgh, uses RFID in secure cabinets to track high-cost consumable items such as balloon catheters and stents in its cardiac catheterization lab. Because these supplies sit on a shelf, the purpose is not to locate them, but to register their use, order replace-

ments and keep track of expiration dates, says Dennis Chadwick, technical supervisor for the catheterization lab.

The Carolinas' cath lab had been relying on a paper-based process to track consumption. When a device is used, a sticker is removed from it and affixed to a sheet of paper recording all devices used in the procedure. But staff can get distracted and sometimes forget to transfer a sticker, he says.

Chadwick learned just how inaccurate the old system was in a late 2005 demonstration pitting it against iRISupply. The manual method missed a number of devices, including two stents and several balloons. Based on that rate, it was calculated that the system would pay for itself in 16 months.

Chadwick says the hospital is now poised to go ahead with full implementation of iRISupply but no date has been set yet.

Bryan Christianson, marketing director at Mobile Aspects, says surveys show that staff forget to document items used in procedures 10 percent to 12 percent of the time, resulting in a failure to bill and low inventory, as well as over-ordering to account for the low ordering. In addition, he says, staff members sometimes forget to keep track of expiration dates on time-sensitive devices such as drug-eluting stents.

He says the iRISupply typically costs from \$250,000 to \$500,000, depending on the number of cabinets installed, length of the agreement and the need for external system interfaces, but the yearly savings can be in that range.

For example, the company reports that a cardiothoracic surgical services department saved \$230,000 a year due to lower inventories and a cath lab saved \$250,000 a year by using products before they expired.—L.P.



Photo by Rick Berkey/Carolinas Healthcare System

Dennis Chadwick, technical supervisor for the catheterization lab, Carolinas Medical Center, Charlotte, N.C., replaced the lab's manual method of tracking such items as balloon catheters with an RFID system that tracks not only equipment, but expiration dates.

▼ SEARCHING FOR AN ALTERNATIVE

Seton Medical Center, Austin, Texas, considered using RFID for tracking, but ultimately went with a technology that is brand new in America—ultrasound identification. It has high room-level accuracy, which is important if you want to ensure that a patient or device is in a particular room and not the one next door, says Jeff Falwell, information services project manager at the 541-bed hospital. The problem with radio waves, Falwell says, is that they “leak” through walls, which can mislead the tracking system. Sound waves, on the other hand, do not leave the room. And unlike light, they can reach into every corner and even penetrate some drawers, he says.

To choose a system, Falwell performed an on-site comparison of RFID from an unnamed company with ultrasound from

Sonitor Technologies, Largo, Fla., the U.S. subsidiary of a Norwegian company that developed the technology.

The two systems tracked equipment in a 16-bed wing of the hospital. Falwell says RFID was much more difficult to install because it required calibration to get the right signal. He says it would have had to be recalibrated every time there was a hospital maintenance project and one of the receivers had to be disabled, which was not a problem with ultrasound.

Now Seton is in the process of installing ultrasound throughout the hospital, making it one of the first in the United States to use the new technology.

Falwell says Seton will begin using it to track equipment, then later, to track patients. He says data from the system also could be used for efficiency reports,

such as measuring how much equipment is used on a particular type of patient. And emergency physicians on staff have told him they want to use it to automatically track their movements for various hospital audits.

Terry Aasen, president and CEO of Sonitor, says the system is technologically agnostic—it can integrate with tracking software from a variety of the company’s partners, including RadiantWave, Nacogdoches, Texas, and Agility Healthcare Solutions, Glen Allen, Va.

Aasen says it costs about \$300,000 to \$500,000 for a medium-sized hospital to install the Sonitor system hospitalwide, including the price of software, and that is 15 percent to 20 percent less than the cost of installing the equivalent RFID system.—L.P. MMHC



(TOP) Jeff Falwell, information services project manager, Seton Medical Center, Austin, Texas, shows Judy Thompson-Price, volunteer, how to find a wheelchair with the ultrasound identification system. (TOP RIGHT) Sequential compression devices are tagged to ensure inventory control. (BOTTOM RIGHT) The electronic tag ensures high room-level accuracy.



Photos by Marc Swendner/Seton Medical Center

