

# RFID Showcase

## *Coming to the AID of Healthcare*

*by Tom Inglesby*

Many companies focus on the realm of RFID (radio frequency identification) for healthcare, and there have been some significant challenges both on the R&D side and the practitioner's implementation side. "Healthcare needs significant disruptive change to address its problems, and there are many maturing technologies that can help," notes Fran Turisco, an Emerging Practices research principal in CSC's Global Healthcare Services Group, Waltham, Mass. "For example, RFID technology has helped researchers at the University of Texas Southwestern Medical Center and UT Arlington to develop a test for acid reflux and potential Barrett's disease. Combining RFID with impedance monitoring, an emerging science that tracks reflux using electrical impulses, the new system involves 'pinning' an RFID chip, about the size of a dime, to the esophagus. The chip tests for electrical impulses that signal the presence of acidic or nonacidic liquids moving through the esophagus and transmits data to a wireless sensor worn around the patient's neck."

Although the patent-pending system is still in development and in testing on animals, researchers believe it will be a welcome replacement to the flexible catheter tube that must be snaked through the nose and into the esophagus, the current procedure.

### **Tag, You're It**

According to Ken Laing of RealRFID, Inc., Los Angeles, "We are working closely with both partners and medical companies in the orthopedic market to automate item-level tagging of medical products using RFID technologies. RFID will eliminate expired or near-expired product being shipped to hospitals and automate the immediate replacement of product used in operating rooms."

In one application, RFID tags and their associated equipment track the expiration dates on stents. An RFID reader interrogates the inventory of stents daily and reports to both the hospital and the device supplier. Reordering medical devices, such as implants, can be done from the operating theatre by reading the tag on the packaging of used implants and then transmitting the information over the facility's cell network. It is possible for replacement implants to be shipped same day.

### **Counting in the OR**

ClearCount Medical Solutions, Pittsburgh, Penn., has extendable RFID-based SmartSponge and SmartWand-DTX systems for counting and detecting surgical sponges. The system uses a small, passive RFID tag securely embedded in each sponge. RFID provides unique numbering and does not require a line-of-sight reader. The SmartSponge System offers the accuracy and efficiency of RFID in a simple and user-friendly interface, with a large, easy-to-read full color display to monitor sponge counts. Sponges are scanned in by simply touching each unopened pack to the In-Scanner. As sponges are used and discarded, they are automatically scanned out. There is no need to separate sponges, as the system will simultaneously count them regardless of the type or quantity disposed.

Dr. Jeffrey Port, cardiothoracic surgeon with Cornell Medical Center and co-founder of RF Surgical, Bellevue, Wash., explains, "An important, newer use of radio frequency technology is an application for the prevention of a dangerous and costly medical error—retained surgical items such as a sponge, towel, or gauze left inside a patient following surgery. This

incident can cause a host of problems, such as post-procedure infection, bowel perforation, abscess, pain, the need for follow-up surgery, and even death.

The RF Surgical Detection System was the first medical device solution to address the problem of retained surgical objects in patients. The system uses a signal to read through deep cavity tissue, fluids, and bone to detect if tagged surgical materials remain in a patient following surgery as a supplement to the standard of manual counting protocols in the OR. The latest version features an automatic detection mat for “hands-free” scanning that can be done in 15 seconds to mitigate the risk of a retained sponge even during emergency, “no time to count” procedures.

### **Meds and More**

Another problem that hospitals have is missed doses and medication errors. Aldo Zini, CEO of Aethon, Pittsburgh, Penn., claims, “Most hospitals would say that they probably lose a million dollars a year just on missing doses. Chemo drugs don’t get put away—in some cases the shelf life is 30 minutes so they have to throw it away. We’re looking to deploy passive RFID tags starting with high-value narcotics, chemo drugs, IVs, those things that cost a lot of money and need to be tracked.”

The University of Maryland Medical Center (UMMC) invested in the Aethon MedEx system to track controlled substances at every point in the delivery process from the pharmacy satellites to the patient care units. Meagan Rushe, UMMC clinical pharmacist explains, “This RFID technology system, in conjunction with biometric technology and our current delivery system, affords the required measure of regulatory accountability to the process. The new technology easily integrates into our current practice. RFID readers occupy a minimal amount of space, and strategic placement of the readers does not interfere with the current infrastructure.”

Technology keeps improving and solving the challenges that are common in healthcare. For example, the use of RFID tags on medical products that can withstand gamma radiation of up to 45 kilogray (kGy) allows for products to be tagged and then sterilized, which eliminates implementation roadblocks.

### **Where Is It?**

Jonathan Zalewski, EMS coordinator, Summa Akron City, and St. Thomas Hospitals, Akron, Ohio, is an RFID adopter, “We are using RFID tags from Barcoding, Inc. Baltimore, Md., to track EMS squads and their cots in and out of our emergency department as a passive way to gather information on EMS wait times. We placed an RFID reader at the ambulance entrance, and it records a timestamp as the EMS cot passes by on the way in and out. We now have data on how long the crew was in the department. Since implementation, we have been able to establish a benchmark turnaround time of 15 minutes.” Real Time Location Systems (RTLS) and the newer Ultra Wide Band (UWB) WiFi tag can map the location of equipment—and people. In Eugene, Ore., PeaceHealth Oregon Region introduced a patient tracking RTLS from Versus Technology, Traverse City, Mich., in the emergency department of its Sacred Heart Medical Center. Before Versus, patient flow was captured manually on a greaseboard (or two). But, as Marvin Hammerschmith, regional analyst at PeaceHealth recalls, the data was never current. “Even with only 12 patients at a time, that greaseboard was never up-to-date. At our RiverBend facility we sometimes have 30 to 40 patients in the ED at one time. Really, I cannot even fathom keeping up with that on a greaseboard. Now, with Versus, information just flows automatically—and it’s up-to-date.” RTLS temperature tags are being widely used in hospital pharmacies, blood banks, laboratories, operating rooms, and nursing units. Clinical nurse Charlotte Miller, who is also healthcare solutions director at Aeroscout, Redwood City, Calif., explains, “A Wi-Fi tag enables you to do that because you don’t have to go to every fridge every couple of hours and hand write in a log. The system can do it for you and alert you if there are errors. You can see trending and history and you know if you have a problem with a medication that has been in a fridge that wasn’t validated properly.”

Miller suggests another important aspect of RTLS in hospital routine, staff tracking, and, equally important, staff protection. "There is a problem going on in emergency rooms right now because ED staffs have been physically or verbally abused, or had violence against them, according to an ED nurses association study. Now you have the ability to have a badge that's a duress button. You hit that button and it can send an alert, an alarm that pops up on the security guards computer screen and tells them exactly where that person is. It's been proven that when there's a duress button the level of violence against that staff will go down. I see people using the technology to help with things that they can't really do right now."

### Improving the Search

Greg Smith, account manager at Smith & Schaefer, Cincinnati, Ohio, examines some of the improvements in RFID that are helping healthcare facilities to adopt the technology. "Room level accuracy within three meters is critical for determining the exact location and status of a device. You must have room-level accuracy in order to improve processes. The self-forming, self-healing Zigbee network can provide this accuracy for workflow improvement. You also need facility wide coverage—multiple buildings and multiple floors must be covered to track critical assets wherever they travel in a hospital."

Many facilities are implementing new RFID systems. Disney Cancer Center uses RFID to track patients throughout every stage of their treatment and environmental settings in rooms automatically adjust to pre-selected preferences. Sutter Tracy Community Hospital in Tracy, Calif., installed RFID to track newborn babies using a Pediatric Security Solution. The Blood Centre of Wisconsin uses RFID to track blood bags and blood products, and Greenville Memorial Hospital, S.C., tags 600 pieces of mobile equipment in a 32-room operating suite—including infusion devices, OR tables, stretchers, and X-ray machines—with active Wi-Fi tags, leveraging the Wi-Fi network in the operating suite. Massachusetts General Hospital implemented an RFID system for tracking patients and employees. This allows Mass. General's clinics, throughout the Boston area, to gather information regarding patient flow and bottlenecks, with the goal of improving care.

High performance tags that are easy to deploy and low-cost RFID systems are becoming available. This, along with the desperate need to reduce healthcare costs while also improving patient outcomes, should increase the use of RFID technology in healthcare in the coming year.

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### RFID—The Technology

In RFID, radio waves emitted by a transponder (a combination transmitter and receiver or responder) are reflected by a tag attached to something or someone. An RFID tag is an **active tag** when it is equipped with a battery that can be used as a partial or complete source of power for the tag's circuitry and antenna. A **passive tag** is an RFID tag that does not contain a battery; the power is supplied by the radio waves emanating from the reader.

An **active tag** can be read at distances of one hundred feet or more, greatly improving the utility of the device. However, the tag cannot function without battery power, which limits its life. Also, the battery can be a problem because outages in an active tag can result in expensive misreads.

With a passive tag the power is supplied by the reader. When radio waves from the reader are encountered by a passive tag, the antenna within the tag forms a magnetic field that provides power to the circuits in the tag. The tag can be read only at very short distances, typically a few feet at most, limiting the tag's applications.

The **passive tag** has a useful life of twenty years or more and is typically much less expensive to manufacture than an active tag. It can also be much smaller—some tags are the size of a grain of rice and can be subcutaneous injected.