Northwestern Memorial's investment in RFID results in real-time inventory accuracy and improved workflow for clinicians.

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Feb 23, 2015—When Northwestern Memorial Hospital (NMH) began exploring technologies to improve inventory management roughly five years ago, it wasn't motivated by any specific event or mandate.

"Our overarching goal was to gain central control of inventory, taking it out of the clinicians' hands so they could focus on patient care," says Brian Stepien, the director of supply-chain distribution and logistics at Northwestern Memorial HealthCare, the parent company of the 900-bed teaching hospital in downtown Chicago. "We wanted the ability to track supplies in real time. It was important to us to step out of what's normally the health-care supply chain centered on clinicians having to document, item by item, every time they use any surgical supply or medication.

Tagged orthopedics in an OR supply room

"But," Stepien adds, "we were in cost-optimization mode, like every other hospital preparing for health-care reform and lower reimbursement rates. And when we're looking at cost efficiencies, we'd rather look at technology efficiencies than look at cutting people."

To that end, Northwestern Memorial worked with Advanced Research Company (ARC), an Orion, Mich.-based vendor, to develop an RFID-based inventory-management solution. ARC has since spun off a medical specialty division, ARC Healthcare Technologies.

In 2012, Northwestern Memorial Hospital deployed an RFID solution to track and manage medical supplies used in its main operating room. The following year, it began rolling out the solution to other hospital departments. And last year, the organization rolled out the system to its 200-bed Lake Forest Hospital.

Today, NMH RFID-tracks roughly 26,400 items at the main hospital alone. The facility has improved cost efficiencies by reducing product loss due to unused or expired items, and by ensuring patients are billed for the products used during their stay.

In addition, rather than cutting jobs, the solution improved workflow for physicians and nurses.

Identifying Business Goals
Before NMH could choose a technology to track supplies, it had to identify its business goals. The organization formed a cross-functional team, with representatives from IT, supply chain and clinicians. The team identified three main objectives. One was to reduce or eliminate expired products. In a hospital setting, Stepien explains, "even the best clinician can order a product that ends up sitting on the shelf," because a patient's needs change or the clinician leaves or switches departments.

A related objective was to reduce or eliminate slow- or no-move products. "Items that have no expiration date or a really long expiration date can kill your overhead," Stepien explains. "We crank out more than 100 cases of product a day—we're a Level 1 trauma center—but there will always be some items we may use only once a year, and some will become obsolete."

A door portal verifies all items are checked out properly.

Stents, heart valve replacements, pacemakers, cochlear implants, catheters, and artificial hip and knee joints are among the many items used in surgery at NMH, Stepien notes, "but maybe the technology has changed, or the surgeon has a preference for a certain brand or model. With knee and hip joints, for example, there are a lot of manufacturers, and it's inefficient to carry them all."

The third goal was to optimize charge capture, or billing. During each surgical procedure, for instance, a nurse was traditionally assigned to serve as charge master, manually documenting every item used, so the hospital could bill the patient for it. However, Stepien says, "this was not their primary role in the OR suite, so it was easy to miss something, and the hospital had to eat that cost."

"We had everyone involved working with us from the get-go, so we already had buy-in," Stepien says. "Of course, we had to present it to the capital committee, and we were competing with people who needed funding to buy medical equipment. But we had the trust factor on our side."

In the course of their due diligence, Stepien and team members attended an RFID Journal LIVE! conference and "got curious" about systems that had been used to track supplies in retail and other industries. They then invited "all the major RFID players in

the health-care space," he says—as well as ARC, whose Helios RFID inventory-management system had been designed to track parts in the automotive and manufacturing sectors—to bid on their inventory-management project.

"ARC had never played in the health-care space, and that was advantageous to us," Stepien says, explaining why NMH decided to go with that provider. "They had no canned product, which meant we could partner with them to develop what we needed."

Designing the Solution
The team decided to first RFID-enable the storage room outside one of the hospital's primary operating areas—a 10-OR corridor devoted largely to orthopedic surgeries, with a large supply room at one end. "We prioritized based on where we'd get the biggest bang for the buck, from a dollar perspective, related to supply cost," Stepien says. Hip and knee joints and other orthopedic implants, he adds, are "high-dollar items you don't want to lose or miss a charge on."

A checkout kiosk was installed in the storage room, equipped with AWID readers and antennas, and RF Ideas badge readers. In addition, says Bill Sharp, ARC Healthcare Technologies' founder, a door portal was installed, equipped with an Impinj reader and a Times-7 antenna, essentially as backup, "to verify if something has not been checked out properly."

When supplies arrive at the hospital, each item's bar code is scanned, and that data, including lots and serial numbers, is transmitted to ARC's Helios software. The software assigns a unique identifier to each item, and then an ultrahigh-frequency RFID label, made with an Impinj Monza chip on a Smartrac inlay, is printed and attached to the item. Each label includes the item's ID, product specifications, expiration date and other details.

Authorized employees use their RFID badges, originally issued for access control, to check out items at the kiosk. The RF Ideas readers capture user data, and the AWID readers and antennas capture product data. The Helios software associates the user and product information, along with the event time and date, for inventory and chain-of-custody records.

Brian Stepien

"We took a whole room, added antennas and readers, and turned the entire space into an RFID cabinet," Stepien states. "It's like a Home Depot self-service checkout area on steroids, but instead of using bar-code readers to swipe products, you just swipe your badge."

ARC worked closely with NMH to customize the Helios software. "We didn't have to change our workflows," Stepien says. "All the other technology vendors we spoke to had a very specific workflow that had to be followed to make their product work accurately. This system was built to work with our current workflow."

The Helios software is integrated with NMH's Cerner patient software system, including the billing module, and its PeopleSoft enterprise resource planning software. This creates a "solid line between inventory, billing and replenishment," Stepien explains.

The Helios database houses the information about inventory levels, product expiration dates, reorder amounts and related billing information, Sharp says. Purchase orders are generated automatically to prevent out-of-stocks, and unbilled patient charges are flagged. Daily inventory reports, customizable with detailed views by item, department, employee and other factors, are accessible to authorized users via a Web portal.

"By interfacing directly with each of these systems," Sharp reports, "we're able to leverage the data from the RFID tag to update each system automatically, eliminating manual entry and the associated errors."

Deploying the Solution
"It took roughly one year to develop and deploy the RFID solution in the first OR area," Sharp says, "and another year to improve and expand the functionality of the system." Both Sharp and Stepien say that the project went smoothly overall, though there were some challenges.

For ARC, that involved adapting the inventory-management system for the health-care sector. The accuracy and efficiency of the technology are essential, Sharp says, but "aesthetics" and "cleanability" are more critical in the hospital environment than in manufacturing. What's more, he notes, "health-care facilities are more siloed with respect to their IS, supply-chain and clinician departments, so implementation is a little more complex in working with all the stakeholders."

Ensuring the readers could identify packages containing liquids, such as IV fluids and tissue packed in liquid agents, as well as items wrapped in foil, such as stents and polyester meshes, was a balancing act, Stepien says. The team created "a tag that looks like a Post-it note," he adds. "We had to play a lot with adhesives, but we couldn't use too much adhesive because it would ruin the integrity of the package, and if we didn't use enough it would fall or peel off."

Antenna placement was challenging as well, Stepien says. Testing to make sure there were no dead spots "was like a giant physics experiment." To avoid potential interference from metal, he notes, the team went with all-composite shelving in areas containing RFID readers.

Working on the development site was both exhilarating and time-consuming, Stepien says. "Now we could probably do an entire hospital in six months," he states, "but it took us longer because we were building it as we went."

ARC and NMH worked together to develop a training program. Getting users acclimated to the automated inventory-management system wasn't difficult, Stepien reports, though some took to it more readily than others, depending on their level of comfort with technology. "We have guys who've been here for 30 years who aren't exactly computer-savvy," he explains, "so you have to go a little slower with them."

The supply-chain management team conducted the training in special sessions and informally during staff meetings. First, supply-chain personnel were taught how to use the equipment, after which the clinical staff learned the specifics of using the system in their day-to-day roles.

Following the initial deployment, NMH rolled out the solution to other areas, including the cardiac floor, outpatient surgery, interventional radiology, the catheterization lab and gastroenterology—and then to the Lake Forest community hospital. The configuration of NMH's RFID system is "a hybrid," Stepien says. NMH bought 14 secure cabinets equipped with Impinj readers and Laird antennas, and also retrofitted some older cabinets with Impinj readers and Laird antennas, to house stents, valves and other costly items.

Existing cabinets were retrofitted with RFID readers.

"In the beginning, we did a lot of training," Stepien says. "Now we train a service line at a time, as we add a new unit or department. We train the supervisors in every group, but we've learned not to take on the whole world at once."

Multiple Benefits

NMH is currently tracking inventory valued at more than $10 million. "We started with a threshold of $250 minimum per item, because the tags at that point cost maybe 20 or 30 cents apiece," Stepien says. "But the cost has continued to go down, so now we track everything that's $50 and above—we've lowered the threshold, because we've found that it's worth it.

The biggest benefit of the RFID system is the real-time accuracy—"that ties into everything," Stepien says. "It allows us to optimize labor and minimize risk." When NMH clinicians scan an item in the OR, the data is pushed automatically to inventory, patient documentation and billing systems simultaneously, he says.

To minimize the problem of expired supplies, the system is configured to send e-mail or pager alerts to the inventory team at selected intervals. "We'll get a list of all the items, and their physical locations, that will expire within the next 120 days," Stepien says. "Now we can work with vendors to trade for fresher stock, or with clinicians to use up these products first." This, he adds, saves a lot of labor hours employees previously spent checking the dates of medications and other supplies.

What's more, Stepien says, he ran an "unscientific study" in the OR comparing the results of RFID-based inventory tracking with those of manual tracking. Nurses perform charge capture as one of their functions in the OR, he says, but from time to time, implants and other items can be missed or incorrectly coded, and patients are not billed. He found that, on average, the charge master was losing 2 percent to 3 percent per case. "That's not terrible in terms of percentages," he says, "but it's huge over the long haul.

"We caught $4 million in charge costs over two years," Stepien adds. "That's a really nice ROI."

Perhaps most important, Stepien says, is that the RFID solution enabled the hospital to reach its overarching goal of freeing clinicians to focus more time directly on patient care. "Clinical coordinators in the OR used to spend about 40 percent of their day on inventory and supplies for cases," he notes. "This has been virtually eliminated."

Eye Toward the Future

The NMH team is currently piloting a Helios RFID-enabled kanban system to track low-dollar supplies—"everything stocked on a unit, from bandages to Vacutainers," Stepien says,—in the main campus's inpatient units.

ARC's kanban system has been up and running for two years at the University of Chicago Medical Center, Sharp says, where workers use it to order more 1,500 line items per day, including gauze, tape and exam gloves, with delivery that evening back to the hospital. "This is what we are duplicating for NMH."

The "next step" for NMH, Stepien says, is to replace the self-checkout kiosk in the main OR with what he calls a "door model." Installing readers on doorframes to credit or debit an item automatically each time an employee crosses a doorway, he says, would be a "dream state" for nursing.

The hospital is also considering piloting an RFID system to track more expensive pharmaceuticals and, potentially, medical specimens in real time, Stepien notes. "We're always looking for ways to tweak and improve the system," he says. "We also want to expand it further in our suburban hospitals.

"I would love to see manufacturers and distributors include tags on all their products so it's easy to track supplies from cradle to grave," Stepien adds. "But that's probably a matter of getting critical mass. For now, it's up to hospitals and other health-care facilities to implement their own RFID systems.

"Everyone has to do it—it's the right thing," he says. "This is money under the couch cushion. Every single hospital has this money—it's right there. Nobody has to be involved but yourself, and it's to your own benefit."