



Case Study: Massachusetts General Hospital Increases Revenue by \$1 Million Annually

Recognizing a Charge Capture Problem

Massachusetts General Hospital (MGH), the Boston-based, #3 ranked hospital according to US News and World Report, has successfully deployed RFID-based technology from Mobile Aspects to automate charge capture and inventory management across its procedural areas. This case study will take a closer look at the experience of the Interventional Radiology department at MGH.

MGH performs about 650,000 radiology examinations annually, and the Interventional Radiology (IR) department carries out around 15,500 procedures. In 2001, Robert M. Sheridan, the Director of IR, installed a bar-code system to better track its inventory. The system brought major improvements—"we thought it was the bee's knees," Sheridan said—but about 20 percent to 30 percent of the information in the inventory-management system was incorrect due to manual errors, and inventory accuracy was off because, during stressful clinical situations, workers do not always remember to scan bar codes.

MGH was determined to seek out a fix to its revenue leakage from the missed charges. The Interventional Radiology department turned to Mobile Aspects' iRISupply solution to help plug some of those leaks.



Hospital

Massachusetts General Hospital

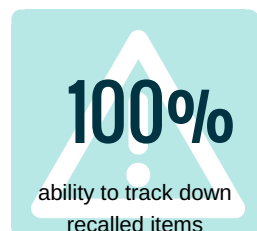
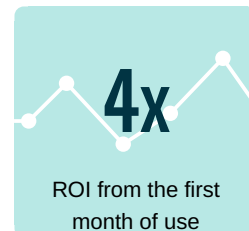
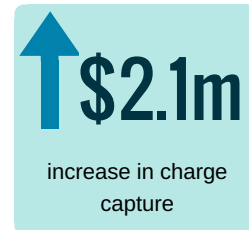
Department

Interventional Radiology, ORs, Cath Labs, and EP Labs

Solution

iRISupply Inventory Management System

Results



Prepping for Success

To obtain the initial investment funds for the RFID-enabled cabinets, Sheridan said he had to show management that there would be value in the technology. He focused on the six IR suites, where workers are often highly stressed since a patient might be dying, and looking for items would only increase their stress.

"We needed to figure out how to use RFID to enhance what they are doing," Sheridan said, "so we mapped the current work process to find where we were losing data capture and, ultimately, revenue. We found we were losing 10 to 20 percent from missed charges related to data loss. We do procedures valued at tens of millions of dollars, so the amount was not insignificant. This is not about cutting costs. You are capturing revenue that you have been leaving on the table."

The installation began small, with five Mobile Aspects cabinets in a single IR suite. Stent graphs and other high-cost items, such as coils, were tagged using passive high-frequency (HF) 13.56 MHz RFID inlays compliant with the ISO 15693 standard, and were then stored in the cabinets. If an IR technologist required an item, that worker would have to scan his or her RFID-enabled badge, choose the patient from a daily work-list screen on the door and remove the item needed. The asset would be automatically associated with the particular patient's record, and then be decremented from inventory. Ultimately, Sheridan said, the cabinet eliminated five manual tasks associated with managing inventory levels, including the process steps most prone to mistakes: entering product codes, lots and serial numbers

Early in the deployment, Sheridan's team decided that 70 percent of the cabinet space would be allotted to the 10 percent of the items with the highest value, such as stent grafts that cost as much as \$7,500 apiece, as well as embolization coils priced at \$1,000 to \$1,800 each. This would not only guarantee that critical devices required for patients would remain in stock, but also help ensure that the RFID cabinets delivered a return on investment (ROI). Lesser-value

items, such as \$15 guide wires and catheters, would be tracked by iRISupply via bar codes, as staff members had been doing since 2001 with their prior bar-code based inventory system.

"We had six neurointerventional techs, and we trained them on the workflow, and what we expected to get out of [the RFID system]," Sheridan said. "We had weekly meetings with the staff, and shared with them the reports and data. We got them to buy into it and use the system."

Measuring the Benefits



Increased Charge Capture and Revenue

Training continued for three months, and Sheridan's team began measuring the collected data. Improvements in capturing patient charges led to an expansion of the system to 13 cabinets. "We outfitted the entire neurointerventional suite, which includes two full labs, a workup area and a recovery room," Sheridan explained. "That allowed us to have a full look of everything we had. We tracked approximately 1,400 products worth several million dollars."

According to Sheridan, the decision was made because the hospital was able to capture an additional \$2.1 million in charges that would not have otherwise been recorded over the course of a year, thereby resulting in approximately \$1 million in additional reimbursements from insurance companies.



Reduced Administrative Burden on Staff

The system was then integrated with MGH's PeopleSoft enterprise-management software. The team was able to set minimums, maximums and par levels for monitoring the inventory levels of items within the cabinets. Every day at 2 p.m., two inventory managers for that group received a reorder file that they could look over in order to catch any possible mistakes before placing orders.

"This was huge, because it gave us accurate consumption," Sheridan said. "We were ordering exactly what we needed, when we needed it. Reordered items came to the back of the hospital at 8 a.m. next morning, and were delivered by 10 a.m. to the department. They were then tagged and put in an RFID-enabled cabinet. That shortened our life cycle by a day and a half. It was pretty amazing stuff, and our inventory managers were thrilled at that point."

The system was also integrated with the hospital's Epic electronic medical record (EMR) to reduce the documentation burden on staff during procedures. iRISupply is able to send over a precise list of items used in each procedure directly to Epic via a bi-directional interface. That automated workflow replaced a previously manual process where a nurse or inventory tech had to enter the items used in each procedure via the on-screen prompts in the Epic EMR. Now, workers simply validate the items automatically entered via iRISupply during each case rather than inputting them manually. This saves the team many valuable minutes per case.

Improved Billing Workflow

For the next phase, the team began talking to staff members regarding where RFID could deliver greater benefits. For example, billing personnel must take a dictation for a given patient—a record of everything performed on that individual—and type the information into a billing system. This creates errors, Sheridan said, since workers may write down the wrong serial number or lot number on paper-based patient logs, and they sometimes make errors when transcribing information into the billing system.

The team set up a separate workstation and created an interface that sent information about products consumed directly to the dictation. Physicians could remove anything taken out of a cabinet but not used, or just sign off on it if everything was in order. As soon as the doctor signed off on the products used, the system would send a message to the radiology

information system, enabling the billing department to see exactly what was consumed, whether it was chargeable or not chargeable, the price and so forth.

"So we brought clinical people, end users, technologists, administrators, coding and billing people, and the physicians" into the system, Sheridan reported. "We touched the five different work forces to make the transaction involved with one patient happen. It was a pretty amazing thing for us."

Reduced Stock-Outs, Eliminated Cycle Counts and Improved Visibility

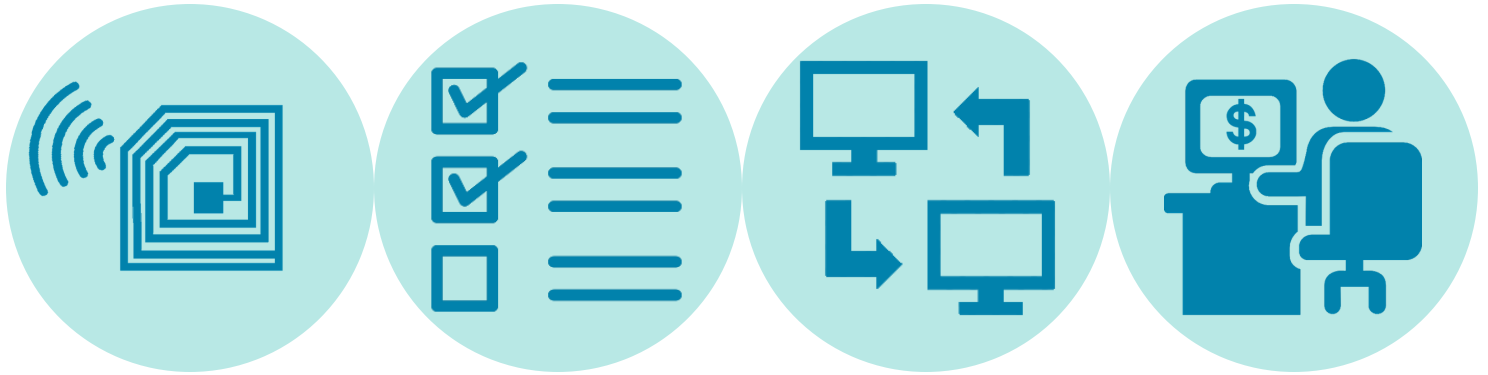
Sheridan's team conducted a six-month study to quantify the return on investment, as well as performing time-and-motion studies. Improvements in charge capture led to approximately a 400 percent ROI, he reported—and there were other benefits as well. Stock-outs were reduced, but not by a huge amount, since with the old system, inventory managers made sure items remained in stock. Sheridan's team ultimately determined that the RFID solution reduced the amount of time that the clinical staff spent counting inventory each day by approximately 66 percent—from three hours down to only one.

There was also the added benefit of locating desired supplies at the touch of a button. "The physicians loved being able to go online and see that a particular stent graft for this particular patient is on this shelf in this cabinet, and is available for them to treat the patient," Sheridan said. "They thought it was the Holy Grail of being prepared for procedures."

Quicker Response to Recalls and Expiration

What's more, responding to product recalls became easier with RFID—which is important since the quantity of recalls ordered by the U.S. Food and Drug Administration (FDA) have increased by 400 percent since 2001. And in one case, the RFID solution alerted the staff that they were about to implant

Automated Charge Capture and Billing Workflow



Medical devices used in a case are automatically associated to patient's EMR record via RFID technology

→ Medical devices are validated during the procedure in real-time by staff

→ Medical device usage for the procedure is transmitted via interface directly to the billing system upon case completion

→ Billing team is presented with a complete, accurate record of items used in the procedure to maximize charges

expired coils worth \$6,800 within a patient. Overall, the MGH IR department estimates that there was an 8% increase in patient safety due to the elimination of expired items being used in procedures.

Example of Lead Time Alert Email

Mobile Aspects Expiration Lead Time Alert

Jul 11 2017 3:10AM

S.No	ItemID	Catalog #	Lot #	Location	Expires	Lead Time(Days)
1	49972	10800703	MGPC290	CAB 2, SHELF 1	07/31/2017	19
2	57016	70-5160	TC04	CAB 5, SHELF 3	07/31/2017	19
3	57017	70-5160	TC04	CAB 5, SHELF 3	07/31/2017	19
4	57018	70-6160	TC04	CAB 5, SHELF 4	07/31/2017	19
5	57019	70-6160	TC04	CAB 5, SHELF 4	07/31/2017	19
6	52177	CRUOS106	GFZF2409	CAB 3, SHELF 2	07/31/2017	19
7	2640	CT2020	0000478460	CAB 1, SHELF 2	07/20/2017	8
8	2641	CT2020	0000478460	CAB 1, SHELF 2	07/20/2017	8
9	2643	CT2020	0000478460	CAB 1, SHELF 2	07/20/2017	8
10	2644	CT2020	0000478460	CAB 1, SHELF 2	07/20/2017	8
11	48452	G05576	5083302	CAB 2, SHELF 3	07/31/2017	19
12	48453	G05576	5083302	CAB 2, SHELF 3	07/31/2017	19
13	62182	G38480	C1273231	CAB 4, SHELF 2	07/12/2017	1
14	54475	GM1833	150819	CAB 3, SHELF 3	07/31/2017	19
15	54031	GR3506	150817	CAB 4, SHELF 1	07/31/2017	19

Huge ROI Leads to Rapid Expansion

With the validation that the IR department was receiving a 4x ROI from its investment, MGH has quickly realized the operational and financial benefits it would gain by expanding the system to other procedural areas. Over the past few years, MGH has expanded iRISupply to track its valuable implants across all of its major surgical areas: Vascular and Interventional Radiology, the Operating Rooms, the Cardiac Catheterization Labs and the Electrophysiology Labs. MGH's parent, Partners Healthcare, has even expanded iRISupply to some of its regional hospitals to optimize business practices, and more growth is planned for the near future.

"In the beginning, I was unconvinced RFID was the way to go," Sheridan stated. "Now, I am convinced."

Re-printed and updated article from RFID Journal titled "Massachusetts General Expands RFID System for Inventory Management" by Mark Roberti