

Evolving RFID Transforms Pharmacy Operations

Introduction

Radio frequency identification (RFID) technology can be leveraged in health systems to track—in real time—the physical location of anything from patient beds to a single unit of medication. This technology is currently in use in 40% of US hospitals, with an additional 31% reporting an interest in exploring this area.¹ Pharmacy is uniquely positioned to lead the charge for RFID adoption, as this technology improves inventory tracking, waste reduction, and recall and shortage management, among others.¹

RFID systems address the burden of staffing constraints, as they allow faster turnaround times on tray and kit restocking times, freeing up time and resources of pharmacist and technician staff.¹

As its uses expand beyond tray management, the benefits seen in pharmacy workflow can increase. Most importantly, real-time medication tracking offers efficiency and security for the patient.

In terms germane to hospital pharmacy practice, RFID technology comprises very small chips embedded in labels that contain pertinent drug information. Unlike bar codes, these chips can be tracked passively, without having to scan the code to retrieve its data. Each chip's information can be read from increasingly long distances (in some cases, up to 100

feet)² and external (battery) power is not required for the labels to function.

RFID offers immediate product visibility for pharmacy. And in contrast to bar codes, which can only be scanned one at a time, an RFID tag reader can read thousands of tags at once, enabling increased efficiency in accessing medication data. Bar codes and RFID can certainly work together given that the FDA requires a linear bar code on all pharmaceutical products, while the addition of RFID enables fast, reliable, and safe tracking of these products.

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As such, the employment of RFID technology can help pharmacies save money and time, and the data encoded within the tags supports automation efforts by reducing user touch points.

Transformative RFID Advancements

Due to a reduction in size and increased processing speed, RFID tags are becoming more appealing and easier to implement. “The latest generation of RFID chips are the size of a grain of sand or a speck of pepper,” says Mike Isabell, principal engineer

at CCL eAgile, an RFID label manufacturer and solution provider. “The tags can be as small as a quarter inch square in size and have an exceptionally high read range.”

Improved memory technology enables more information to be stored on the tag, including but not limited to NDC codes, serial numbers, expiry dates, and batch/lot numbers. Furthermore, the latest generation of tags can be read accurately at greater distances without the need to scan a bar code or use a back-end data system to receive the full data (see **SIDEBAR 1**).

One key to widespread RFID use in healthcare settings is data standardization, which helps ensure compatibility with medication management systems and software. In a recent survey, compatibility/interoperability with existing technology tops the list of what is most important to pharmacy, surpassing cost and technical support.¹ Therefore, using products that are pre-tagged by the manufacturer is preferable to outsourcing this process to a third party or completing this task at the facility by hospital staff. This also ensures increased safety, as pharmaceutical manufacturers employ thorough validation procedures to ensure high quality and accuracy. Tags are placed in the correct location for optimal performance, whereas pharmacy has to guess when affixing a tag.

Ideally, source tagging is standardized, similar to 1- and 2-D bar codes. This can be aided by RAIN RFID, a passive, battery-free wireless technology that adheres to global standards. By utilizing RAIN RFID tags that are processed with RAIN RFID readers, users can identify, locate, and authenticate every tagged item, providing real-time insight.

“Considering all the different places that tagged medications travel through—from manufacturer to distributor, to hospital, to pharmacy, to operating room, to waste stream—placing RAIN RFID labels on these medications could open up new use cases beyond the hospital or pharmacy environment,” says Gaylene Meyer, vice president of global marketing and communications at Impinj, a provider of RAIN RFID products and solutions.

GS1 Sets the Standard

RFID tagged products that contain standardized information enable hospitals to effectively manage patient safety concerns, such as product recalls and expiration date violations, as well as timely wastage of expired products.

GS1 US, the same non-profit organization that set the standards for 1- and 2D barcodes on pharmaceutical products, also has a long history in the RFID space. GS1 US is currently driving the effort to adopt standardized RFID solutions (see **SIDEBAR 2**). GS1 US works to create universal RFID solutions, and the organization

examines and modifies its standards on an ongoing basis to remain abreast of industry’s needs.

“Using standardized identifiers that are known and utilized across the supply chain,” says Andrew Meyer, director of global standards at GS1 US, “means you don’t need to rely on back-end systems for critical data, because the information that matters for patient safety is presented directly on the tag.” This process enables the data-rich tags to operate smoothly across an entire health system and within a variety of products and devices. This level of compatibility ensures that the right product is delivered to the right patient at the right time.

The Time for RFID is Now

The use of RFID technology in pharmacy settings is on the rise. According to *Pharmacy Purchasing & Products’* most recent survey data, 26% of US hospital pharmacies are currently utilizing RFID, but of those, most are using the tags on less than one-fifth of their inventory. Increasing this number is certainly a priority for these facilities. In fact, 54% of hospital pharmacies are interested in increasing RFID usage, although they cite a lack of source tagging as one of the roadblocks to implementation.³ ASHP’s recent survey underscores the need for RFID compatibility within ADCs. This would enable a leap forward in improved product visibility as well as substantial time savings within the pharmacy workflow.¹

Given that standardization and source tagging drive successful RFID adoption, manufacturers such as Fresenius Kabi have recognized the need and are offering pre-tagged, ready to read products. Pharmacies can benefit from partnering with suppliers that are eager to follow technological trends in offering up-to-date solutions. This may include manufacturer tagging with GS1 standards for products that healthcare facilities need, with consideration of DSCSA guidelines.

As health systems continue to embrace this technology, its functionality can expand. Jonathan Hwang of UC Davis Health says, “I would love to see RFID more broadly implemented in inpatient dispensing operations to reduce ongoing manual operations.” As next steps for this capability, he cites advantages such as removing the need for cycle counts, streamlining dispensing cabinet outdated, and automated dispense tracking, saying, “This would require significant integration across various systems but would be great to see.”

“Imagine the potential to your operations if pharmacy, nursing, and anesthesia teams no longer had to spend valuable time counting and recounting narcotics, locating missing or recalled medications, and logging lot and expiration dates,” says Gwen Volpe, senior director of medication technology at Fresenius Kabi. “With pre-tagged RFID products, manufacturers can support the proliferation of this technology that truly

Sidebar 1. Key RFID Features

1 RFID is affordable.

- With source tagging at the manufacturer, there is little need to invest in new equipment for the packaging process. Source tagged products benefit pharmacy, in that staff time is not consumed by manual tagging tasks, thereby saving money and time while reducing risk.
- Pharmacies utilizing real-time RFID technology experience improved control over inventory, ordering, and wasting, which reduces costs.

2 RFID tags are data-rich.

- By utilizing modern RFID chip sets, all essential product information can be stored on the tag. This means that the drug’s label is a one-stop source for information without the need for a proprietary software system.
- The latest GS1 Tag Data Standard v2.0 allows for an easier and faster method to store the product data onto the chip, making it even more efficient for pharmacies to read the drug information from the RFID label.*

3 RFID delivers speed.

- There is a myth that adding essential information to the tag (eg, expiration date, lot, etc), causes it to lag or operate slowly. However, current tag and reader technology allows RFID labels to be applied and encoded at manufacturing line speeds of up to 600 parts per minute.
- To see the RFID process in action, RFID manufacturer CCL eAgile has established an Experience Center to demonstrate the technology. As an example, their system can read 1000 tagged vials in less than 2.5 seconds.

* GS1. EPC Tag Data Standard. <https://ref.gs1.org/standards/tds/2.0.0>. Accessed March 13, 2024.



Case Study: RFID Utilization in a Major Health System

By Jonathan Hwang, PharmD, BS, Central Pharmacy Operations Manager, UC Davis Health Recipient, ASHP RFID Technology Research Grant



At UC Davis Medical Center in Northern California, the pharmacy utilizes passive RFID to track and monitor crash carts, transport bags, anesthesia trays,

OR medication trays, and general inventory management, in conjunction with real-time location services (RTLS).

A long-time user of RFID technology, UC Davis adopted their first RFID system in 2012 and continues to expand its functionality. Central pharmacy operations management oversees a team of approximately 100 pharmacists and technicians serving 700 beds within the health system, plus emergency and OR departments.

To mitigate the end-of-the-month rush on cart restocking due to expiring medications, the pharmacy uses RFID technology to review the complete stock list of medication carts three times throughout the month to determine which medications are approaching expiration. Immediate visibility into these data increases efficiencies, as the RFID tags enable expiring tray contents to be easily identified and exchanged at their current location, rather than requiring a return to the pharmacy.

RFID Implementation Tips

Plan for evolving workflows. As with any new technology implementation, the pharmacy will need to adapt to a new workflow. Implementation of RFID can shift labor upstream, as more time may be spent tagging medications upon addition into inventory, replacing the more

time-intensive tasks related to manual verifications of lot numbers and expirations during kit and tray replenishment. Notably, this represents a substantial reduction in verification time while simultaneously shifting responsibility from pharmacists to technicians. With tech-check-tech, restocking of automated dispensing cabinets (ADCs) could be significantly improved with the addition of RFID capability.

With these concepts in mind, position the asset management team for success by establishing realistic expectations and providing thorough training and resources. For best results, create a formal policy delineating operational responsibilities and participate in on-site training with the RFID vendor.

At UC Davis Health, a specific technician shift is devoted to overseeing RFID responsibilities, which primarily consist of preparing OR RFID trays. Pharmacy management created formal policies and placed job aids throughout the workspace to support workflow adoption and best practices. By switching to the acquisition of medications pre-tagged by the manufacturer, the new workload may be reduced to a point where the devoted technician shift is no longer warranted.

Remain patient throughout the onboarding process.

A new workflow can be disruptive at first, but ultimately, the benefits of time and cost savings become apparent. As RFID technology is implemented, allow ample opportunity for staff to communicate feedback as they adjust to the new processes.

Use pre-tagged medications where possible.

Standardized, pre-tagged products drive effective implementation of RFID technology. In addition to the benefits of accuracy and time savings for staff, professionally added tags are more physically reliable, as they are embedded in the label. If products cannot be tagged by the manufacturer, a third party may be hired to complete this task. Conversely, when facilities tag their own products, the tags are prone to falling off or sticking to trays, defeating the purpose of RFID/RTLS tracking.

Benefits Realized

Three primary benefits of RFID utilization are improved efficiency, increased visibility into inventory, and enhanced patient safety. The cost of an RFID program can generally be justified via the resultant and considerable savings in pharmacy staff time. While the benefits may not be seen in the form of FTE reduction, staff can be repositioned to address other departmental needs. These benefits and return on investment are measurable within weeks of implementation.

In addition, RFID technology can be leveraged to monitor staff performance and completed work, as well as to reduce staff performance variance. RFID establishes clear visibility into the status of all medications positioned within pharmacy kits and trays, an ability that leads to further downstream cost reductions. Most important, the use of an RFID system increases patient safety. With this technology in place, pharmacy is assured that all medications in use in patient care areas are within date.

Sidebar 2. About GSI US

- GSI US recently celebrated the 50th anniversary of the first bar code scan, which was on a pack of chewing gum in Troy, Ohio, in 1974. At the time, the organization was known as the Universal Code Council (UCC), which has since evolved into GSI US (a member of the global GSI federation).
- GSI is a not-for-profit organization that aims to provide a neutral meeting place for industries to work toward universal solutions.
- GSI's standards are global and available to the public for free. GSI also provides guidance, research, and support, free of charge.
- GSI continues to modernize RFID standards to support various industries. Standards are continually examined, and if new use cases or additional requirements are needed, the standards are then modernized to adapt. As an example, second generation tag encodings have been developed to meet the needs of multiple industries, including healthcare. These changes enable the tags to efficiently contain the same data as the GSI DataMatrix codes that are already widely deployed.
- Similarly, healthcare professionals have requested the addition of new pharmaceutical tag grades. Tagged Item Performance Protocol, or TIPP, can be utilized to define the necessary protocols to determine tag grades for common healthcare applications, such as vials or syringes found in hospital crash carts or surgical settings.

improves healthcare workflows.” Looking to the future, she adds, “As more manufacturers provide pre-tagged products, medication automation vendors now have the power of RFID to take their systems to the next level to improve patient safety and clinician efficiency.”

Conclusion

The promise of RFID-related technology is too rich to ignore. It represents an evolving stage of asset management that has moved beyond two-dimensional

constraints. This mature and powerful technology can unlock substantial benefits for healthcare providers of all sizes. Look for opportunities to expand RFID utilization throughout your institution, as there are multiple disciplines that can benefit. Likewise, discuss implementing RFID with your product and medication suppliers, pharmaceutical manufacturers, GPOs, 503B vendors, and other asset providers. Through RFID, pharmacy leaders can be sure to leave no asset behind.

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2. CCL Healthcare. Radio Frequency Identification (RFID) Overview. <https://cclhealthcare.com/packaging-products/pharmaceutical-labels/smart-and-intelligent-packaging/smart-packaging-rfid-overview>. Accessed January 30, 2024.
3. Unit Dose Packaging Systems: RFID in Pharmacy. *Pharm Purch Prod*. 2023;20(8)19.

RFID Resources

Select RFID Vendors

Amerisource Bergen/Cencora

www.amerisourcebergen.com

BD www.bd.com

Bluesight www.bluesight.com

Health Care Logistics www.gohcl.com

Intelliguard www.ig.solutions

Pevco www.pevco.com

Tecsys www.tecsys.com

Terso Solutions

www.tersosolutions.com

Further Reading

AIM Global RFID Experts Group

- www.aimglobal.org/rfid-experts

ASHP Foundation

Advancing Medication Safety Through Technology Innovations: Focus on Radio Frequency Identification Technology

- www.ashpfoundation.org/-/media/REF/Research/PDFs/ASHP_RFID_Report.pdf

RFID Technology in Medication-use Systems: Considerations and Recommendations to Advance Implementation

- www.ashpfoundation.org/-/media/REF/Research/PDFs/2024-REF_RFID_Survey_Report_FINAL.pdf

GSI

US DSCSA Implementation Suite

- www.gsius.org/industries-and-insights/by-industry/healthcare/standards-in-use/pharmaceutical/dscsa-implementation-guidelines

Implementation Guideline for RFID in Healthcare Manufacturing

- www.gsius.org/content/dam/gsius/documents/industries-insights/by-industry/healthcare/guideline-toolkit/Implementation-Guideline-for-RFID-in-Healthcare-Manufacturing.pdf

RFID Standards and Electronic Product Code (EPC)

- www.gsi.org/standards/rfid

EPC Tag Data Standard and EPC Tag Data Translation Standard

- www.gsi.org/standards/tds

RAIN Alliance

- www.rainfid.org/healthcare