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Radio Frequency Identification Enhances Patient Safety

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Technology Gains Traction in Health System Pharmacies for Drug Inventory and to Automate Applications

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RADIO FREQUENCY IDENTIFICATION (RFID) is a technology that uses tags and readers to identify and collect asset information. In pharmacies, this usually means RFID is used for high-cost equipment or pharmaceuticals. RFID applications have been in use for many years but recently gained traction in health systems. RFID is becoming particularly effective in drug inventory and automation applications, such as medication carousels and pick-to-light systems.

Traditionally, the most popular use in pharmacy has been in code tray and box management applications.[1,2] Between 2004 and 2009, RFID technology was actively pursued by pharmaceutical companies and wholesale distributors, which envisioned streamlining the inventory management process in their vast warehouses. However, costs and technical difficulties swung the pharmaceutical industry globally to deploying 2D barcodes for serializing products and tracking them through the supply chain. Passage of the Drug Supply Chain Security Act (DSCSA) in the United States in 2013 and the Falsified Medicines Directive in the European Union in 2011 locked in the path chosen by the industry.[3,4]

The mention of the DSCSA highlights a critical element of this RFID movement: The technology can supply the same or even better anticounterfeiting and supply chain visibility that 2D barcode system delivers, including all data the law mandates. Technically, the FDA has required the use of 2D barcodes and human-readable product identification on packages so, at best, RFID would duplicate but not substitute the 2D barcodes.[2]

RFID has many advantages over linear 2D barcoding. For example, a barcode on a medication bottle includes a stock-keeping unit that represents the national drug code and may contain other information, such as the expiration date, lot number, and package size. However, it does not change without being substituted with a new packet or sticker, needing a direct line of eyesight and human manipulation. The 2D barcode is limited in the number of characters it can maintain and can be difficult to read depending on the condition of the barcode. Furthermore, the 2D barcode is easily counterfeited, whereas an RFID tag is nearly unattainable to counterfeiting.[5]

RFID uses radio waves for data collection and transfer and is considered a next-generation innovation for automatic data collection and asset tracking. It can capture data automatically and efficiently without human intervention. RFID technology sales for supply chain applications recorded $1.43 billion in 2019 and have continued to grow.[6] Although the cost of the application is greater than barcode technology, there are many operational gains justifying the cost, including improved privacy, safety, and security.

Including RFID in pharmacy promotes inventory management and improves picking accuracy, identification, and safety. These systems enable real-time data use, which leads to the prevention of inventory loss and theft. In addition, integrating RFID-enabled systems with wholesalers and other inventory systems facilitates better inventory management, resulting in less overstock and improved operational efficiency.[6,7]

With the rapid development of science and technology in health care, the market for high-value medical consumables also continues to advance. As consumables

are more widely used, health systems can provide a higher level of care. In pharmacy, because of the high price and variety of high-value medications (often specialty drugs), it is critical to carry out efficient and traceable control of these products' procurement, storage, allocation, user registration, and waste disposal. RFID systems enable visual information management of the whole process and allow a real-time 2-way traceability closed-loop management to secure the quality and safety of consumables. As a result, the RFID system recognizes the best information management of the whole process of high-value consumables application, approval, procurement, acceptance, warehousing, inventory management, and warehousing use. At the same time, it can instantly identify consumable information and carry out batch warehousing operations, which is convenient and fast, effectively reducing clinical workload and improving efficiency.[8]

RFID technology is being used in prefilled syringes in acute and critical care settings. These ready-to-administer syringes can be combined with passive ultra-high frequency RFID tags, reader stations, and cloud-based registry to help clinics and hospitals automatically and individually identify each unique product.[9,10] This has major safety implications, as the product can be identified, product quantity adjusted, and reordered without scanning the product.

As the use of RFID expands, these products can be used to prevent missing medications in tube systems, improve materials management and the process of tracking of patients, and be embedded into labels and with pick-to-light technologies with RFID to enhance safety. Pharmacies play a crucial role in achieving an RFID-integrated health system to optimize patient outcomes, safety, and value in managing assets and inventory. Therefore, pharmacy managers should continue educating the pharmacy team and other professionals about the potential of RFID and support manufacturers and vendors to continue financing enhancements to improve operations and patient care using less manual information and more self-dependent workflows.[1] ■

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