

Hospital — Pharmacies

White Paper

Operational Recommendations to Support Barcode Scanning Effectiveness across the Medication Use System

Industry leaders share their insights to barcode scanning success from implementation to optimization.

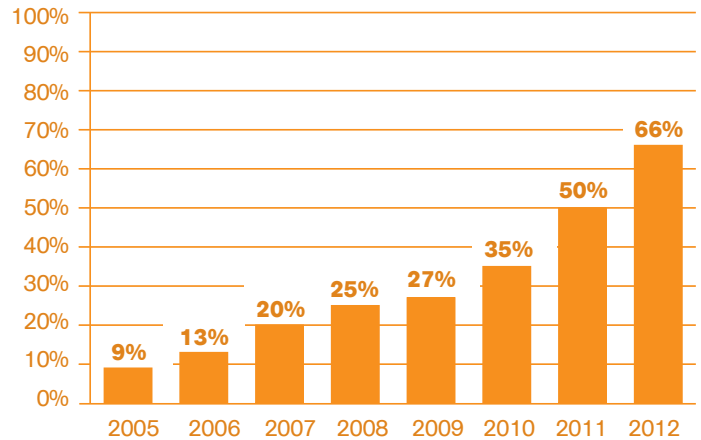
Operational Recommendations to Support Barcode Scanning Effectiveness across the Medication Use System

Industry leaders share their insights to barcode scanning success from implementation to optimization.

Increasing adoption of barcode scanning technologies is a key way health-system pharmacies are continuing to evolve. Barcoding medications is paramount in helping to improve safety across the entire pharmacy operational process and it may provide direct financial benefits as well. Reasoning includes:

- Use of barcode scanning in pharmacies is consistent with the Pharmacy Practice Model Initiative's (PPMI) vision in which pharmacy practices help improve medication use, patient safety and efficiency. Further, the use of barcode scanning technologies may allow hospital pharmacists to delegate some tasks associated with drug preparation and distribution to well-trained technicians, freeing pharmacists to spend more time on patient-care activities.
- Barcode medication administration (BCMA) promises further patient safety by reducing medication administration errors by as much as 86%.¹ BCMA adoption has increased rapidly over the past five years and continues to grow, driving hospitals to evaluate barcode usage in their pharmacies. The impetus for this change is the 2009 American Recovery and Reinvestment Act (ARRA), which requires providers to attain a list of "meaningful use" criteria including the ability to "automatically track medications from order to administration using assistive technologies in conjunction with an electronic medication administration record (eMAR)."²

Barcode Medication Administration Trend



Source: 2012 ASHP National Survey Results: Implications and Trends for Today's Practice; 2012 Midyear Clinical Meeting.

Experience has shown that adoption of barcode scanning technologies is most effective when it results from deliberate decisions about processes and technology, collaboration between the pharmacy and other disciplines (especially nursing), extensive training, ongoing measurement of results, and a cycle of continuous improvement. For organizations implementing barcode scanning technology or working to improve and optimize existing barcode scanning systems, insights and direction can be gained from three important questions:

1. What are the key processes to be evaluated with implementation and utilization of barcode scanning technology?
2. What are the critical decisions that must be made?
3. What can be learned from those who have successfully implemented this technology?

The experiences of industry leaders who have implemented barcode scanning can help answer these questions. To that end, and with recognition that hospitals and health systems are in different phases in implementing barcode scanning technologies and BCMA, McKesson formed a task force of distinguished pharmacy leaders with extensive experience related to barcode scanning technologies and BCMA. Each of these leaders is a member of the McKesson Executive Alliance. The task force helped address the questions above and shared key operational recommendations for pharmacists to consider when contemplating or working on improvement of barcode scanning programs.

The task force's input shows there are multiple ways to leverage barcode scanning to achieve this optimal vision of pharmacy efficiency and patient safety. There is no single path to reach this ideal state. The best approach for a pharmacy will depend on the organization's vision, the nursing care delivery model, the infrastructure, and the available technology. As the task force members offered advice for implementing and optimizing bedside scanning initiatives, they used the product flow managed by the hospital pharmacy as a framework for their recommendations.

Pharmacy Practice Model Initiative (PPMI) National Dashboard³

Goal 1: Pharmacist roles, practices and activities will improve medication use and optimize medication-related outcomes.

Goal 2: Pharmacy technicians will prepare and distribute medications and perform other functions that do not require a pharmacist's professional judgment.

Goal 3: Pharmacists and pharmacy technicians will have appropriate training and credentials for the activities performed within their scope of practice.

Goal 4: Pharmacy departments utilize available automation and technology to improve patient safety and improve efficiency.

Goal 5: Pharmacists will demonstrate leadership in exercising their responsibility for medication-use systems and will be accountable for medication-related patient outcomes.

"The American Society of Health-System Pharmacists (ASHP) encourages health systems to adopt barcode-enabled medication administration (BCMA) technology to improve patient safety and the accuracy of medication administration and documentation. Pharmacists must be involved in the interdisciplinary planning, development, implementation, and management of BCMA systems and must ultimately be responsible for developing and maintaining the infrastructure required to ensure BCMA success."⁴

The McKesson Executive Alliance Task Force Members

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The Executive Alliance is a collaboration of well-known leaders who are dedicated to advancing hospital pharmacy's contributions to patient safety, clinical quality, and financial performance through increased effectiveness and efficiencies. Active since 1998, the Executive Alliance maintains a strong and prestigious membership, representing the entire health-system continuum, from internationally known academic centers to community-based hospitals. McKesson is proud to sponsor this energetic group and the task force for this paper.

Five Stages That the Task Force Considered When Implementing or Optimizing Barcode Scanning



Purchasing

Receiving

Repackaging

Dispensing

Administering

1. Evaluate Purchasing Practices

Before implementing a barcode scanning initiative, hospital pharmacists must evaluate product procurement strategy and procedures. This evaluation may range from a simple formulary review with reductions in similar products or low-utilization items to a comprehensive formulary review, including all drug types, forms, NDC numbers, purchase quantities, and variations currently in the pharmacy information system. If a medication on the formulary does not have a barcode, plans must be made to address the issue.

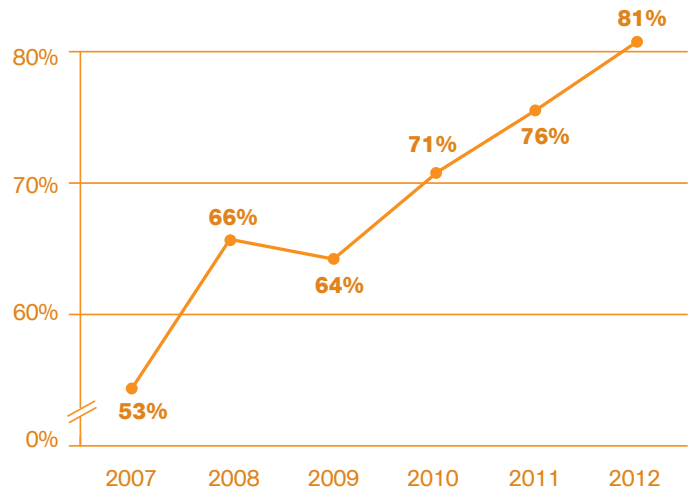
Pharmacy Purchasing & Products' 2012 National Survey on the State of Pharmacy Automation reported that 81% of facilities conducted barcoded unit dose packaging for at least some of their inventory, up from 53% five years earlier.⁵ Although hospitals may be able to purchase 70–90% of medications in unit dose form, the pharmacy team may still want to evaluate the cost of doing so. It is important to consider internal capabilities, workload, automation, tools, resources and labor. Purchasing decisions must consider what type of drug distribution and dispensing model the organization plans to use and how barcodes fit into that model. For example, barcodes may need to be integrated into an automated distribution system. Alternatively, in a decentralized model, barcodes may simply need to be compatible with the bedside scanning devices.

Regardless of the path, the pharmacy must decide how best to get barcodes onto products that do not contain a readable barcode. This will likely involve repackaging and/or labeling. Such decisions are based on thoroughly understanding the products being used, the volumes of each, internal resources, and the expected volumes in the future.

The task force had seven recommendations for streamlining the purchasing process to support barcode scanning:

- **Thoroughly understand all medications your hospital pharmacy is purchasing.** This includes the quantity, form, and whether each has a barcode.
- **Assess the ability to scan medications used in the organization.** Just having a barcode is not enough as many products with barcodes may not scan. A key baseline metric is the ability to scan each medication.
- **Work with your wholesaler.** Inform the wholesaler that your organization is implementing barcoding at the bedside and determine if there are tools or programs to proactively identify products available in unit dose barcoded format. The next step is developing a strategy for items not available in unit dose form (or in unit dose without a barcode).

Hospitals Conducting Barcoded Unit Dose Packaging



Source: Pharmacy Purchasing & Products. The 7th Annual State of Pharmacy Automation. August 2012. Vol. 9, No. 8. Retrieved from <http://pppmag.com/digitalmag/Main.php?MagID=2&MagNo=72&n>.

- **Ask GPOs their philosophy around criteria for awarding contracts and barcoding.** Some GPOs may preferentially award products that are in unit dose form and barcoded.
- **Proactively identify challenging products.** Identify product forms, such as vials and ampoules of injectable medications, soft plastic dosettes of medications for inhalation or nebulization, and patches and blisters of items such as nicotine gum, that may not scan well with manufacturer barcodes.⁶ Barcodes may need to be manually affixed to these items after production.
- **Decide how to handle products without barcodes.** It is inevitable that some medications, like half tablets or compounded drugs, won't have barcodes. A process must be developed for creating barcodes for these items. Once a decision is made how to deal with these items, the organization must apply the standard consistently.
- **Design the process to accommodate drug shortages.** When pharmacies encounter drug shortages, they often transition from one medication to another. Barcode "stacking" or "nesting" enables multiple NDCs and barcodes to be associated with a given product, making substitutions easier. Master drug databases and processes must be flexible enough for multiple product identifications. Bear in mind that multiple databases may be used to support barcode-related processes.



2. Integrate Scanning into the Receiving Process

Once drugs arrive on-site at a hospital, the receiving process begins and scanning must play a central role to support the efficacy of barcode medication administration. Important considerations related to receiving include:

- **Create a database with all drugs on the formulary, including barcode information.** This may be a freestanding database, or the drug database can be integrated with a hospital’s electronic health record. Once this database is created — which is a significant undertaking — a hospital is ready to barcode scan the drugs it receives.
- **Determine the best way to integrate successive checks into the receiving process.** Successive checks are a proven way to ensure success for barcode scanning initiatives. For example, scanning may be done multiple times: when drugs are received on-site, when medications leave the pharmacy or when they are scanned into the automated dispensing cabinets, and finally when nurses scan drugs for patient administration. Where in the process these checks occur will depend on the model used.

For example, some organizations ensure that all the products are identified by always quarantining or sequestering drug shipments and only releasing them to the pharmacy after one of each product is scan tested. This ensures that all new products or items where the NDC has changed are identified by the pharmacy at the time of receiving.

Alternatively, some organizations receive a signal from their wholesaler that a new product has been distributed. With this information, the pharmacy can quarantine the product until it is added to the master drug database. Others do scan testing for 6–12 months, as they are initially building their drug database. After the drug database has been developed, these health systems sequester and scan products upon receipt only when the buyer notifies the information technology team that a new product is being purchased; they do not scan each drug shipment on an ongoing basis.

- **Implement processes for updating the drug database.** The hospital’s drug database must constantly be updated with information on any new products, NDC changes on existing products, and for any substitutions required due to drug shortages. At Virginia Mason Medical Center in Seattle, database updates are integrated with the purchasing process so the database is completely updated upon receipt. Other task force members emphasized the need for real-time processes, so IT can update the database in the event of mistakes or exceptions.
- **Use the same scanners as the nursing staff.** It is essential that pharmacies utilize the same scanners in the receiving and barcode quality assurance process as are used on the nursing units. If this practice isn’t followed, a medication may scan in the pharmacy but not at the bedside. This is because the functionality of barcode imaging hardware varies substantially based on manufacturer, hardware age and configuration.

“Scan testing [upon receipt] is a best practice because it helps assure achievement of 100% scannable doses at the bedside, as well as distribution. Barcodes should be a tool for nurses to administer the right medicine, not a barrier to care.”

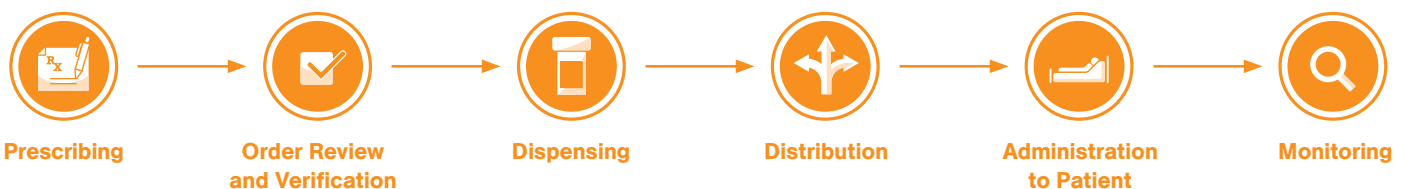
Janet Silvester, Director of Pharmacy and Emergency Services, Martha Jefferson Hospital, Charlottesville, Virginia

“All too often, pharmacy leaders underestimate the resources required to keep the drug databases up to date.”

Tom Thielke, Emeritus Clinical Professor of Pharmacy, University of Wisconsin, Madison, Wisconsin

Keep in Mind the Entire Medication Use Process

This white paper focuses on the physical movement of drug products in the medication use process (“Dispensing” through “Administration to Patient”). The holistic view of the overall medication use process is shown below.



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3. Decide Which Repackaging Approach Best Fits the Organization's Needs

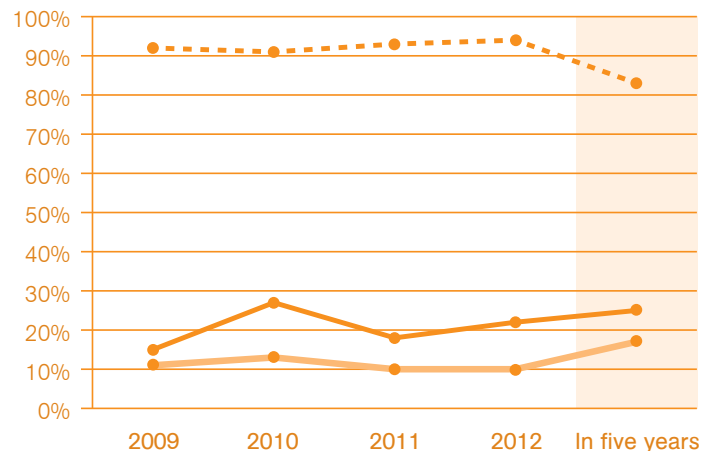
To support barcode scanning and BCMA, certain drugs that lack scannable barcodes or are not manufactured in a unit dose barcoded form will need to be repackaged or labeled. Historically the recommendation has been to maximize the purchase of commercially available unit dose products with manufacturer barcodes;⁷ however, with increased scrutiny of costs, some hospitals have re-evaluated their approach. In some situations, it may be financially attractive for a pharmacy to purchase drugs in bulk and repackage them into unit dose.

Pharmacies generally have two choices for repackaging:

- **In-house.** In-house repackaging may take place in a variety of forms from tadpole labeling to high-speed automated packagers. One benefit of in-house repackaging is that it gives pharmacies complete control over the repackaging process. However, it requires that strict quality assurance procedures be developed, implemented and maintained. Options for in-house repackaging that may be used individually or in combination are:
 - **Manual.** Hospitals will always have to manually package some medications. For example, hazardous drugs or penicillins can't be used in automated packaging machines because they leave residual powder behind. Although this option is the most labor intensive, it is well suited for very small batches (25 or less), since very little equipment setup or cleanup is required. While it is impossible to completely eliminate manual repackaging, keep in mind that this approach is most vulnerable to human error. Therefore, pharmacies doing manual repackaging must use strict QA practices.
 - **Automated systems.** Automated packaging systems are well-suited for fast-moving medications. They lead to more efficient use of staff, since they can be interfaced with other pharmacy automation and information systems to minimize operator intervention. An automated approach to repackaging works best if pharmacies have sufficient space to accommodate the machinery. The degree to which a hospital adopts automation will depend on the volume of fast-moving drugs. As a result, it is important to conduct an ROI analysis to determine the best automation approach for each repackaged medication and format required.
- **Outsource.** Outsourcing repackaging can free time so pharmacy employees can focus elsewhere. This may be particularly important at smaller hospitals that lack resources. For organizations without adequate space or capital, outsourcing is often a good way to support BCMA without investing in packaging technology. In some cases, there may be unit dose medications that are less expensive to purchase in bulk and have repackaged by a third-party vendor. One advantage of outsourcing is that it gives pharmacies a means to implement BCMA in a scalable fashion without adding internal packaging resources.

All FDA-certified repackagers operate under the same FDA cGMP quality control requirements; however, there is variability in third parties' resources, scale, expertise and breadth of services. It is highly recommended that outsourced providers be adequately evaluated in advance of contracting. The pharmacy should investigate the repackager's quality control processes; observe the repackaging process; inquire about FDA issues including citations, recalls, or FDA warning letters; ask how staff are trained; and request references.

Trends in Packaging Methods



- In-House Packaging Systems
- Outsourced Repackaging Systems
- In-House, Outsourced Repackaging Services

Note: Totals exceed 100% as some facilities use multiple methods.

Source: Pharmacy Purchasing & Products. The 7th Annual State of Pharmacy Automation. August 2012. Vol. 9, No. 8. Retrieved from <http://pppmag.com/digitalmag/Main.php?MagID=2&MagNo=72&n>.

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Apply Lean Methodologies to Barcode Scanning Initiatives

Virginia Mason Medical Center uses Lean methodologies to create a process where products arrive on-site ready to dispense, to the extent where it is possible. Virginia Mason worked actively with their wholesaler to minimize the amount of medication manipulation required, similar to Toyota's application of the Lean model where tires come right off delivery trucks and immediately enter the assembly line where they are installed. The only products barcoded in the pharmacy are compounded medications and oral solids that cannot be repackaged by a third party for regulatory or practical reasons.

Research indicates that most hospitals use in-house repackaging systems, but almost a quarter of pharmacy leaders expect to outsource more repackaging in the future.⁸ The decision to repackage medications in-house or to outsource is not an “all or nothing” decision. Some organizations adopt a hybrid approach, in which some medications are repackaged in-house, while the repackaging of others is outsourced. The balance between in-house and outsourced repackaging may change over time, as the pharmacy's process evolves. Virginia Mason Medical Center, for example, initially used a vendor to package high-use items that didn't have a barcode. As its pharmacy processes matured, they moved more products to in-house packaging.

When deciding whether to repackage in-house or outsource, task force members recommended considering:

- **Facility space.** In-house packaging machines and work areas require valuable pharmacy space. This may be an issue, especially in older buildings.
- **Cost.** Evaluating outsourcing costs requires that the pharmacy determine the total cost of internal repackaging (equipment amortization, maintenance, disposables, labor, space, waste, and the like) as a basis of comparison. A low-cost repackaging capability also allows for the evaluation of repackaging select items from bulk where manufacturer unit dose packaging comes at a premium. Tradeoffs must be considered between the cost of purchasing in bulk and repackaging versus buying barcoded, unit dose medications.

Help Reduce Errors by Using Barcoding for Compounding

Another important consideration is whether barcoding can be introduced to intravenous compounding. It is imperative to catch compounding errors in the pharmacy, since any error would be unlikely to be detected downstream. Virginia Mason Medical Center in Seattle has applied barcode scanning to the medication preparation process.

“Unlike many hospital pharmacies that batch products, we use ‘just in time’ preparation. The label of the compound to be created is scanned, then each ingredient is scanned to validate that it is correct. The finished compound is then scanned and sent to the unit for administration to the patient.”

Roger Woolf, Administrative Director of Pharmacy Services, Virginia Mason Medical Center, Seattle, Washington

- **Control.** In-house repackaging gives health-system pharmacies complete control over the process, which has value. When Janet Silvester determined that the costs of repackaging in-house and outsourcing were essentially equal, she chose to repackage in-house to maintain control. Additionally, at Martha Jefferson Hospital, repackaging in-house allowed for higher robot efficiency.
- **Quality.** Pharmacies must decide which approach will provide quality control they need. When hospital pharmacies get involved in repackaging, they must have the self-discipline to develop and maintain repackaging policies and procedures that meet or exceed the safety requirements applied to third parties.

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4. Evaluate Different Dispensing Models

Pharmacies that have adopted barcode scanning technology typically use one of three models for dispensing medications: decentralized distribution, centralized production and distribution, or hybrid distribution. As teams evaluate different dispensing models, it is important to understand nurses' medication administration processes and to partner with nursing in the entire barcode scanning implementation, both at the outset and on an ongoing basis. The pharmacy model for effective bedside scanning must support the nursing care delivery model.

In examining dispensing model options, the task force recommended:

- **Improve accuracy for automated dispensing cabinets by using a “scan on load” approach.** Scan on load ensures that any product placed in an automated dispensing cabinet matches the storage bin. This may help to provide 100% accuracy in the dispensing process and serves as a successive check that all products used for BCMA will scan effectively.
- **When using centralized dispensing, be aware of timing issues related to replenishment and cart fills.** If hospitals use a robot for centralized fills, they should consider when they replenish the robot. Every step — from packaging to restocking — must be ordered properly to keep stockouts to a minimum. Additionally, par levels must be routinely reevaluated and adjusted for seasonal variation and needs.
- **Consider using Lean principles to streamline processes.** Barcodes can help reduce some of the variability inherent in the medication administration process. Virginia Mason Medical Center incorporated Lean techniques into its workflow. Medications are loaded into automated dispensing cabinets utilizing barcode recognition and a hard stop: if a medication is not scanned and verified as correct, it cannot be loaded into the cabinet.
- **Develop a feedback loop to reinforce desired employee behaviors.** Regardless of which dispensing model is used, the scanning process should include a feedback loop. A system should be in place to analyze the scan rate of products loaded into dispensing devices. If any product was not scanned properly on load, the operator should be identified. The success of safety initiatives relies on feedback that reinforces desired behaviors; without feedback an operator may be tempted to bypass scanning and rely on workarounds.

Check with Your State Board of Pharmacy about Waiver Eligibility

Many state boards of pharmacy require 100% pharmacist checks for medication doses for both packaging and dispensing. Automated dispensing and BCMA are proven processes to ensure a quality check. Some hospital pharmacies have applied for variances from their state pharmacy boards and now do random 5% checks. This efficiency enables technicians to perform additional drug distribution tasks and frees pharmacists to participate in more value-added activities, as PPMI suggests. At Martha Jefferson Hospital, for example, pharmacists now reside largely on the patient care units and are responsible for medication histories, clinical consults, patient rounding, and discharge teaching. This is possible because many distribution functions have been delegated to well-trained pharmacy technicians supported by barcode technology.

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23% of all BCMA workarounds can be avoided with help from the pharmacy

Engage in Continuous Improvement

The task force shared the sentiment that outcomes are only as good as the efforts put into them. Barcode scanning is not a one-time initiative, but rather something that requires continuous improvement to be most successful and bring medication errors to zero.

“We revisit our barcode scanning processes every 12 to 18 months. The way the organization uses different medications changes over time and manufacturers are continually increasing the number of unit dose products that they barcode.”

Bruce Thompson, Director of Health System Pharmacy Services, Hennepin County Medical Center, Minneapolis, Minnesota

5. Incorporate a Feedback Loop into Administration

As many as 23% of all BCMA workarounds can be avoided with help from the pharmacy.⁹ BCMA programs work best when hospitals are committed to ongoing process improvements. This requires performance measurement, as well as periodic analysis of the core processes. The task force recommends several best practices for ensuring BCMA program effectiveness:

- **Collaborate with the multidisciplinary team, especially nursing.** A multidisciplinary team should analyze the results of BCMA and take steps to improve the process. Nursing plays as important a part in barcode scanning as the pharmacy. It can be helpful to ask nursing to own BCMA metrics and report ongoing performance within the organization and to the board.
- **Monitor the percentage of medications scanned on a weekly basis.** It is important to look at scan rates at the organizational level and the individual nursing unit level. Unit managers, as well as specific RNs and operators, should be held accountable for not scanning medications.
- **Track the reasons why nurses opt out of scanning.** One explanation may be that medications do not scan. By monitoring specific reasons why drugs fail to scan, as well as why specific nurses/nursing units do not scan, pharmacies can implement programs to remedy the problems.
- **Revisit your BCMA processes every year or two.** This evaluation should consider whether the use of particular drugs has increased or decreased, as well as whether prescribing patterns have changed. It is also essential to identify whether additional drugs are available with manufacturer barcodes, which could reduce manual barcode preparation.

Conclusion

Barcode scanning can have a profound and positive effect on the medication use system in healthcare organizations. An informed and analytical approach to implementing these technologies can transform the promise of PPMI into a reality, enabling delegation to trained technicians and greater pharmacist accountability for patient care outcomes. Successful barcode scanning programs, however, don't happen overnight. Careful decision-making related to purchasing, receiving, repackaging, dispensing and medication administration is essential. Time spent making these choices helps translate into successful barcode scanning initiatives, effective BCMA programs, and ultimately increased patient safety.

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