The trajectory of pharmacy automation seeks to mitigate pharmacists’ distributive responsibilities and efficiently expand distribution system capabilities, all while increasing patient safety and driving down costs. One such technology—automated dispensing cabinets (ADCs)—has become a near universal component of the medication-use process in health care organizations today. Pharmacy Purchasing & Products’ 2014 State of Pharmacy Automation national survey indicates that 88% of hospitals use ADCs in their medication distribution systems.1 As pharmacy practice continues to evolve into direct patient care, the value of optimized ADC technology becomes more apparent.

Increasing regulatory scrutiny, coupled with initiatives to expand patient care offerings, reduce costs, and maximize safety, have created a dynamic pharmacy practice environment that requires strong technological discipline and performance. However, the rapid development and expansion of ADC applications come with attendant concerns about cost, waste (muda), medication access and security, and employee satisfaction. Because of these concerns, continuous exploration into the optimization of ADC technology is vital to the ongoing strength of the institutional health care facilities that use them.

Overview of ADC Operations
Located in Western Pennsylvania, Allegheny Health Network (AHN) consists of seven not-for-profit hospitals and more than 200 primary- and specialty-care practices. Allegheny General Hospital (AGH)—providing 661 licensed inpatient beds—is the flagship and largest hospital, serving Pittsburgh and the surrounding area. The pharmacy department at AGH employs a clinical specialist practice model in all critical care areas (ie, medical, transplant/surgical, neurology, cardiac, and trauma), as well as a patient-centered, decentralized practice model that places clinical pharmacists on nursing units to provide direct patient care. Operating 24-hour services, the AGH pharmacy distributes the majority of medications utilizing 150 ADCs (52 of which are inpatient) located throughout our patient care areas.

As the utilization of ADC technology expanded rapidly at AGH in recent years, we began to notice non-value-added steps in the medication administration process, an increase in ADC queues during busy med-pass times, delays in care due in part to missing or misplaced medications in the ADCs, and an influx of phone calls to pharmacy. These conditions contributed to nursing inefficiencies in patient care, which in turn negatively affected employee satisfaction. Although we believed in the power of our ADC technology and our distribution model, we realized we needed to reevaluate ADC usage in our inpatient areas in order to optimize the number of machines and inventory, decrease waste of expired medications, and increase accountability. To improve nursing efficiencies, maximize care at the bedside, and reduce the complexity of medication distribution and administration, we chose to apply Lean methodologies to our improvement plan.

Establish a Baseline
The initial goal was to gain a clear understanding of our ADC utilization and then create efficiencies by eliminating ADCs that demonstrated lower than average usage from non-specialty, inpatient nursing units. The second step was to optimize the remaining machines utilizing key performance indicators (KPIs). Finally, we applied the Lean principle of a Plan-Do-Check-Act (PDCA) cycle to evaluate the optimization process, make improvements, and establish a standardized, how-to guide to perpetuate efficient ADC performance.

To begin, we evaluated the average daily use of each of the 52 inpatient ADCs at AGH over a 6-month period; specialty areas and units with only one ADC in use were excluded from the evaluation. We determined that the average daily use of our ADCs was approximately 70 drug removals per day. With this information, we established an efficiency threshold of 60 removals per day; those devices with fewer than 60 removals would be eliminated from the unit. Upon applying this methodology, 28 ADCs were identified as having usage below that threshold. Of the 28, 10 were located either in a specialty area or were the lone ADC in the unit. As a result, 18 ADCs were flagged for elimination.

The next step was to begin optimizing the remaining 34 inpatient ADCs using KPIs. No ADCs were identified as having excessively high usage. Thus, the review did not indicate a need for additional infrastructure.

Key Performance Indicators
By identifying and applying KPIs to our ADCs, we gained greater insight into how best to use this technology for our needs. The following KPIs were selected for application:

Medication removals: Non-emergent medications not dispensed or removed from ADCs within 90 days were earmarked for removal. However, to avoid the removal of necessary medications, all ADC inventory was stratified as standard or non-standard medications, and technicians were permitted to unload only those deemed non-standard. For example, reversal agents or medications that were part of a virtual kit were deemed standard medications for the unit.

Vend-to-fill ratio: A vend-to-fill ratio was created comparing the number of times a medication was removed (vended) from an ADC with the number of times a pharmacy technician restocked the ADC pocket. For a tertiary medical center, the recommended ratio is >11. For the initial optimization of ADCs at AGH, we set a ratio goal of >8. This metric was identified through review of our vend-to-fill ratio for all ADCs; we began at 6.5 and our ideal was 11, so 8 became our initial goal.

Stock-out percentage: The stock-out percentage, which indicates the number of times an ADC pocket has a count of zero, was assigned a target goal of <2%.

The PDCA Principle
In order to evaluate the steps taken to improve ADC usage, we applied the Lean methodology of plan-do-check-act:

Plan: Optimization of ADCs is not a one-time event; continuous assessment and ongoing adjustments are necessary. To that end, an ADC optimization team was created comprising a pharmacist, technician, data analytics specialist, and a clinical

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Reference

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