

The Health Care Improvement Foundation  
2017 Delaware Valley Patient Safety and Quality Award  
Entry Form

**1. Hospital Name**

Thomas Jefferson University Hospital

**2. Title Of Initiative**

Implementation of an IV workflow system to reduce IV preparation errors

**3. Abstract (Please limit this description to 250 words.)**

Our organization is on a journey to High Reliability and no patient harm. High reliability requires focus on technology, collaboration and process. We redesigned our pharmacy process for preparing IV products to increase the reliability and accuracy and reduce the likelihood of dispensing errors. In our old process, we verified product accuracy with the “pull back” method. The preparer pulled back the syringe after completing the preparation to indicate the volume added. This process cannot assure that the volume added agrees with the amount indicated in the pulled back syringe. Moreover, when multiple ingredients may have been used in the compounding process, there is no assurance that the correct amounts of each drug have been used. As a result, our organization implemented an IV workflow system that uses bar code scanning of ingredients (to prevent errors prior to preparation) and photographs of the individual ingredients and corresponding syringes that are used in the process (to allow the pharmacist to verify the accuracy of the ingredients). We compared the number of reported preparation errors in the one year period prior to implementation (26 errors in an estimated 445,783 opportunities) to the 8-month post-implementation period (7 errors in 297,189 opportunities); the decrease in reported preparation error rate was statistically significant (p-value=0.019). Furthermore, the errors that were reported post-implementation all involved situations where the technology was bypassed.

**4. What were the goals of your initiative?**

Patient safety demands highly reliable medication administration and medication events remain a significant national source of patient harm. Pharmacy literature recommends implementing an IV workflow system (1) and recounts the pitfalls of the “pull back” method for checking the accuracy of IV preparations. Our organization had experienced within the past few years a harmful medication error in a pediatric patient that immediately caused us to eliminate the “pull back” method in the pediatric high risk population. However, our adult hospital population did not have the same protection. The goal of implementing the IV workflow system was to reduce the number of preparation errors involving IV products that could subsequently lead to patient harm.

References:

1. Vrabel R. My critical analysis of a deadly medication error – what can go wrong may go wrong. [accessed 2017 June 5].  
<http://www.facebook.com/VrabelConsultingInc/posts/657383927779226>.

**5. What were your initiative's baseline data and the results of your initiative?**

In the one year period prior to implementation of the IV workflow system, there were 26 preparation errors reported by hospital staff. In the eight months since implementation of the system, there have been 7 reported preparation errors among 297,189 doses prepared through the technology. The EHR in use at our facility during the one year period prior to implementation of the IV workflow system does not allow us to determine a denominator for that time period, so that we are not able to calculate a reported error rate for a true statistical comparison. However, there is reason to believe that the number of doses prepared in the pre-implementation period has not differed significantly from that in the post-implementation period. For this reason, we calculated an estimated number of doses for the one-year pre-implementation phase as 445,783 doses (based on the post-implementation production numbers). Recognizing the limitation of this approach, we compared the error rate of the pre-implementation phase to the post-implementation phase and found that the error rate of the post-implementation phase is statistically significantly lower at a p-value = 0.019. Even if we underestimated the number of doses in the pre-implementation period by 10% (i.e. there were 490361 doses), the error rate in the post-implementation period remains statistically significantly lower at a p-value = 0.034.

In each of the seven errors that were reported in the post-implementation period, the system had been bypassed to prepare the dose. Therefore, we have had no errors reported for product that had been prepared using the technology as intended.

**6. Describe the interventions that were instrumental in achieving the results for your initiative.**

The IV workflow system interfaces with our EHR and schedules doses on an ongoing basis based on the time that the dose is due. The pharmacy technician scans the bar code on each product during the preparation process (virtually eliminating the chance of a human error in product selection). The technology directs the technician through the compounding process and photographs are taken at various points to document lot numbers/expiration dates and volumes added/drawn up. The pharmacist who checks the final product is able to remotely review the preparation steps to assure accurate product preparation. This double check is a hallmark of a highly reliable system. The ability to check product remotely has positive effects on staff utilization and productivity as staff is not required to be present in the IV room to perform the function (e.g. a pharmacist rounding in the ICU who needs a product delivered emergently can check the product from a workstation in the ICU). Products can then be tracked through the delivery process. This has helped in cases where the nurse calls for a missing dose, and pharmacy staff is able to inform the nurse where (and when) the medication has been delivered. This has reduced the amount of rework required. Prior to implementation, there was extensive build of the drug database and testing of the interface between the IV workflow system and the EHR. Pharmacy staff received a required one hour orientation to the technology. The IV workflow system was implemented in early November 2016.

Our results showed that the only reported errors post-implementation occurred in situations where the technology was bypassed. As a result, we have reinforced with staff those few situations under which it is allowable to bypass the safety technology of the system. These include those rare instances when a bar code is being used that is not recognized by the system or situations when an IV preparation is needed emergently and use of the technology would delay patient care. We continue to monitor the process and solicit staff input for challenges with the new workflow. The steady redesign and incremental improvement are also part of our highly reliable journey to prevent harm to patients.

**7. How can this initiative be replicated through the region? (Please limit this description to 100 words.)**

Our organization chose to implement a complete IV workflow system, which provides the safety features of bar code scanning/product photographs/remote verification of product volumes with a workflow scheduling system and product tracking system. For institutions that prefer a less costly option, some of the more well-known EHRs have options for using an ingredient barcode scan verification prior to product preparation (i.e. the drug (s) being used are scanned against the medication order). This assures at a minimum that the correct medication(s) is being used (this process is similar to bedside bar code medication administration used by nurses).

**8. Explain how the initiative demonstrates innovation (Please limit this description to 100 words.)**

Experts agree that the “pull back” method for checking IV products is not a reliable method. This technology has eliminated use of the “pull back” method at our organization. Estimates are that <20% of hospitals in the US are currently utilizing bar code scanning of medications during the IV preparation process in Pharmacy(1). Our organization is therefore at the cutting edge of use of this technology. Moreover, we have gone beyond use of technology for product scanning only, also using the technology for assuring the correct volume has been added through photographic documentation of the preparation process.

**9. How does this initiative demonstrate collaboration with other providers within the continuum of care? (Please limit this description to 100 words.)**

A question that has on occasion been asked by both Nursing and Medical staff at our organization is how they can be assured that the contents of a Pharmacy-prepared IV solution is as ordered, since there is usually no way for them to visually confirm. This technology now provides our staff with a great deal of assurance in the accuracy of product coming out of Pharmacy. For this reason, Nursing was highly supportive of our efforts to obtain the technology. We have involved Nursing in the design/approval of labels to assure readability and usefulness of information presented.

**10. Explain ways in which senior leadership exhibited commitment to the initiative (Please limit this description to 100 words.)**

Leadership at our organization is encouraging our quest to High Reliability. This technology was incorporated in the long term organizational strategic plan for improving safety. It was prioritized for implementation prior to a new EHR implementation to assure a smooth transition with the new EHR. The intended safety benefit of the technology led Hospital Administration to approve the financial outlay required to implement the full IV workflow system. Hospital administration requested that the IV workflow system technology be presented at a meeting of key personnel to highlight one effort on the road to High Reliability and sustainable safety gain.