The Health Care Improvement Foundation
2014 Delaware Valley Patient Safety and Quality Award
Entry Form

1. Hospital Name

   Thomas Jefferson University Hospital

2. Title Of Initiative

   Do No Harm: Ensuring Medication Safety

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

Adverse Drug Events (ADEs) affect 2%- 7% of hospitalized patients and cost the nation between $1.5 billion and $5.6 billion dollars annually (1). ADEs were the leading cause of harm in the original Harvard Practice Study (2) and remain major sources of patient harm. In 2010, our organization embarked on a robust, multipronged effort to reduce harm from medications. This effort focused on strengthening the institutional safety culture, addressing human factors associated with error, developing processes to identify and mitigate potential errors, standardizing medication protocols and reviewing near misses and actual errors to identify opportunities for further refinement of medication safety. Safety culture efforts included a monthly good catch program for pharmacy staff and monthly discussions at pharmacy staff meetings of the month's events and dissemination of data with robust analysis of near miss findings. The Good Catch program was later expanded to a hospital-wide program. System changes were implemented with a focus on high-risk medication areas. Level 5 medication events decreased annually between FY2011 and FY14. The days between harmful medication events increased over the past 5 years, demonstrating success from interventions.

1. Reducing and Preventing Adverse Drug Events to Decrease Hospital Costs. Agency for Health Care Research and Quality. Publication. #01-0020 Current as of March 2001. Accessed June 20 , 2014 http://www.ahrq.gov/research/findings/factsheets/errors-safety/aderia/index.html
2. Leape LL, Brennan TA, Laird N, et al. The nature of adverse events in hospitalized patients. Results of the Harvard Practice Study . New Engl J Med 1991. 324: 377

4. What were the goals of your initiative?

   The goal of this initiative was to decrease the number of Level 5 medication events (injury limited to additional intervention during admission or encounter and/or increased length of stay) and to increase the time between harmful medication errors (Level 6 and higher*) while maintaining/increasing overall medication event reporting levels. A secondary goal was to increase the number of pharmacy interventions as a means of assuring safety of the medication use process.

   *Level 6 is defined as bodily or psychological injury, but likely not permanent; harm levels increase in severity up to Level 9, which is death.

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

   The days between harmful medication events increased over the time period between July 2009 and June 2014 (Figure 1). The figure shows a centerline based on the 5-year data, and an upper control limit (UCL) set at 3 standard deviations from the centerline.

The most recent value for time between harmful events is above the UCL, demonstrating that the various efforts described below have been successful in reducing the number of harmful events. The last harmful event was in October 2013, and we are currently over 180 days without a harmful medication event and counting.

In addition, the number of Level 5 events dramatically decreased in each of the years from July 2009 to June 2014 (Figure 2). Despite the decrease in the number of Level 5 events, and the significant increase in the time between harmful errors, the overall medication event reporting rate per dose administered was increased. The increased reporting meets statistical significance in FY2013/2014 as compared to FY2012/2013 (p-value of Pearson Chi-Square test is 0.028). This increase in reporting reflects an improved culture of event reporting.

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

The reduction in occurrence of harmful errors and Level 5 errors was a result of a multipronged approach to address all areas of the medication use process. The backbone of any medication safety program must be a safety culture that supports staff reporting, incorporates their suggestions for change, and embodies transparency. In an effort to encourage reporting and to promote learning from medication events, the Pharmacy department, at its monthly staff meetings (six sessions each month in order to allow staff members from all three shifts to attend) has a standing agenda item entitled "Medication Events." This presentation leads off with recognition of staff who have had "good catches" during the previous month. It is then followed by a description of all events in which Pharmacy had an active role or could have had a role in helping to prevent the event. This presentation often engenders a lively discussion that frequently results in actionable suggestions by staff on how to prevent the errors from occurring again. More recently, the Good Catch program has been implemented house wide for all event types and a monthly award is presented at the Hospital Management Update meeting. An employee recognition program allows any hospital staff member to recognize a colleague for any safety efforts (including medication safety). Medication safety is a standing agenda item at the monthly Pharmacy-Nursing Committee and the hospital Medication Safety Coordinator (MSC) reviews the topic with Nurse Residents as part of the structured program for all new nurses. The Department of Medicine conducts periodic Root Cause Analyses (RCAs), often focusing on medications. These RCAs allow valuable input from the Medical Staff, and help to ensure ownership and buy-in for suggested changes. Finally, the MSC prepares a bimonthly article on medication safety that is distributed electronically to all staff involved in the medication use process. Quarterly medication event reports are summarized in these articles and specific events that have occurred are described, thus promoting transparency.

Certain high risk drugs/areas have been targeted for enhancing medication safety. These are reviewed below.

Chemotherapy

A Failure Mode and Effects Analysis (FMEA) was conducted in 2008 that identified nearly 100 potential failure modes. The FMEA was re-evaluated in 2011 for progress with respect to the recommendations from 2008. Between the two FMEAs, significant improvements have been made in the chemotherapy ordering process, including:

• stricter requirements for reference to support ordered regimens;
• addition of new pharmacist positions in the chemotherapy area;
• a new electronic system that allows tracking of chemotherapy ordering/administration across inpatient/outpatient care areas;
• requirement for physicians administering chemotherapy to follow the same administration safety checks as those performed by Nursing;
• implementation of infusion pumps with dose limit protection
• incorporation of capped maximum doses in the ordering system
• formation of a multidisciplinary chemotherapy event review committee that evaluates all chemotherapy events and makes recommendations for change.
After the initial RCA, the number of chemotherapy events per dose administered decreased, and has remained at a consistently low level (Figure 3).

Pediatrics
As a result of a serious medication error involving a pediatric patient, our organization partnered with the Institute for Safe Medication Practices to conduct a comprehensive review of the pediatric medication use process in 2011. As a result of this collaboration, numerous improvements have been made, including:
• opened a new decentralized Pharmacy dedicated solely to the Women and Children populations, assuring adequate space and appropriate workflow to allow staff to safely perform the dispensing process;
• addition of a second advanced practice pharmacist in the area of Pediatrics;
• changed the process for checking pediatric pharmacy prepared products;
• enhanced the CPOE system to eliminate the need for auxiliary labels and assure that all relevant information for the nurse is on the CPOE system generated label;
• standardized concentrations for intermittent infusions and included these in smart infusion pumps;
• maximized the use of commercially available products to reduce the risk of compounding errors;
• review of all medication events involving this patient population by a multidisciplinary committee
• reinforcement with staff of the importance of reporting medication events. Comparing FY2012/2013 to FY2013/2014, the number of reported events in this population has increased by 66%.

Insulin
Historically at our Institution, insulin events have been among the most serious events reports. Within the past three years, the following changes have been made with respect to insulin:
• pharmacy has assumed responsibility for drawing up all doses of intermediate and long-acting insulins;
• insulin infusions are dispensed in a unique resealable bag so that it appears different than any other medication dispensed by Pharmacy;
• an insulin order hub has been created within the CPOE system to help to guide prescribers through the ordering of insulin products.

Anticoagulants
Our Institution has effectively leveraged our CPOE system in guiding appropriate use of

anticoagulants, both for treatment and prophylaxis of venous thromboembolic disease. Recent efforts involving anticoagulant safety include:

• implementation of an anticoagulant stewardship program to assure the safe utilization of target specific oral anticoagulants (TSOAC). Our experience with this program has been that, although labor intensive, it has been effective in identifying inappropriate use of TSOAC from the community and ensuring safe use of these medications within our institution. Data collected from our TSOAC stewardship program revealed that out of 71 patients prescribed dabigatran, 93% required an intervention and 68% of patients prescribed rivaroxaban required an intervention (N=67). The majority of these interventions involved the elderly population, involved orders on admission due to outpatient use and required conversion to an alternative anticoagulant due to a contraindication for use, a dose adjustment or discontinuation of duplicate anticoagulant orders (housestaff often order a pharmacologic agent for DVT prophylaxis in addition to a treatment dose of a TSOAC).

• Increased participation by pharmacists in formalized patient education programs regarding oral anticoagulants. Since implementation of this program, documentation of warfarin patient education has increased by more than 200%.

• Implementation of two transitions in care programs, one involving patients discharged from the inpatient setting on a chronic anticoagulant and the other involving discharge of patients with an acute DVT directly from the Emergency Department.

Smart infusion pumps and other technology

• Wireless infusion pumps were implemented in November 2012. Prior to implementation, only large volume infusions and select intermittent medications were administered by pump (due to limitations in the drug library size of our prior pump). With the new pumps, all intravenous infusions (intermittent as well as continuous) are included in the pump. Extensive education of Nursing staff resulted in a high compliance rate with regard to use of the drug library. Compliance has remained at a high level of approximately 96% over the past year (i.e. 96% of the time that the start button is pushed, the user is in a drug library entry).

• Bar code scan on refill of automated dispensing units was implemented in June 2013. In the year since implementation, Pyxis refill errors have decreased by 66%.

Opiates

• evaluated and removed high dose HYDROmorphone 4 mg syringes from many areas where it was previously stocked (to reduce overdose errors);

• added a 1 mg HYDROmorphone syringe to unit stocks to reduce the risk of overdose when a partial dose is removed from a 2 mg syringe;

• changed order sets in CPOE system to reflect lower recommended HYDROmorphone doses;

• educated staff about potency differences between morphine and HYDROmorphone (pre- and post-surveys indicated greater staff knowledge after the education).

Pharmacy interventions

Pharmacy staff has been encouraged to document interventions related to medications as learning opportunities. Pharmacy and medical staff leadership have worked to create a chain of command for instances where further discussion regarding the appropriateness of an order is needed. Observation of this process by Pharmacists further encourages

them to follow through on questionable orders, knowing that they have the support of leadership to do so. The number of interventions by Pharmacists have increased over the past 3 fiscal years by 27.8%, 23.3%, and 13.4%. The number of monthly interventions now number approximately 7500. These interventions also alert to potential areas for system improvement.

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

   Each institution should strongly consider appointing an MSC either in a full or part time capacity. Ideally, a Pharmacist is in the best position to assess the entire medication use process from purchasing through administration. The MSC should be charged with analyzing and tracking all medication events, both those that reach the patient as well as near misses, and driving changes necessary to implement and sustain improvement. The Institution should target high risk medications. Finally, the Institution should undertake efforts to sustain a culture of safety and transparency that results in increased event reporting in order to identify medication risks.

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

   Reducing medication harm requires marrying cultural change, robust reporting, technology and near miss analysis with technical proficiency and expertise. The marriage is the innovation. Pharmacists manage high risk medications, including insulin and anticoagulants and actively assess chemotherapy regimens and all other orders. Pharmacists round daily in ICUs. Off protocol orders are scrutinized and the CMO, Chief Patient Safety Officer, and VP for pharmacy call Attendings to ensure cooperation, creating a continuous learning environment. The good catch rewards and wide ranging discussions accelerate and drive process changes to ensure that every medication order is correct and correctly dispensed/administered to every patient.

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

   Medication safety at our Institution is a multidisciplinary effort. The Medication Quality Subcommittee, which oversees medication safety efforts, is composed of physicians, nurses, pharmacists, a respiratory therapist and representatives from Risk Management, Performance Improvement, and Radiology. Changes to the medication-use process are vetted with the appropriate disciplines to assure buy-in and address necessary workflow changes and staff communication.

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

    Senior leadership commitment to medication safety initiatives is evidenced by the continued support of a designated Medication Safety Coordinator position. In addition, the Chief of Pharmacy sits at the Vice President level in our Institution so that medication safety receives attention at the highest levels of the organization. Senior management has requested that periodic reports be made to the Patient Safety Committee to keep them informed of medication safety efforts.

11. Appendices (i.e., tables and graphs)

Figure 1

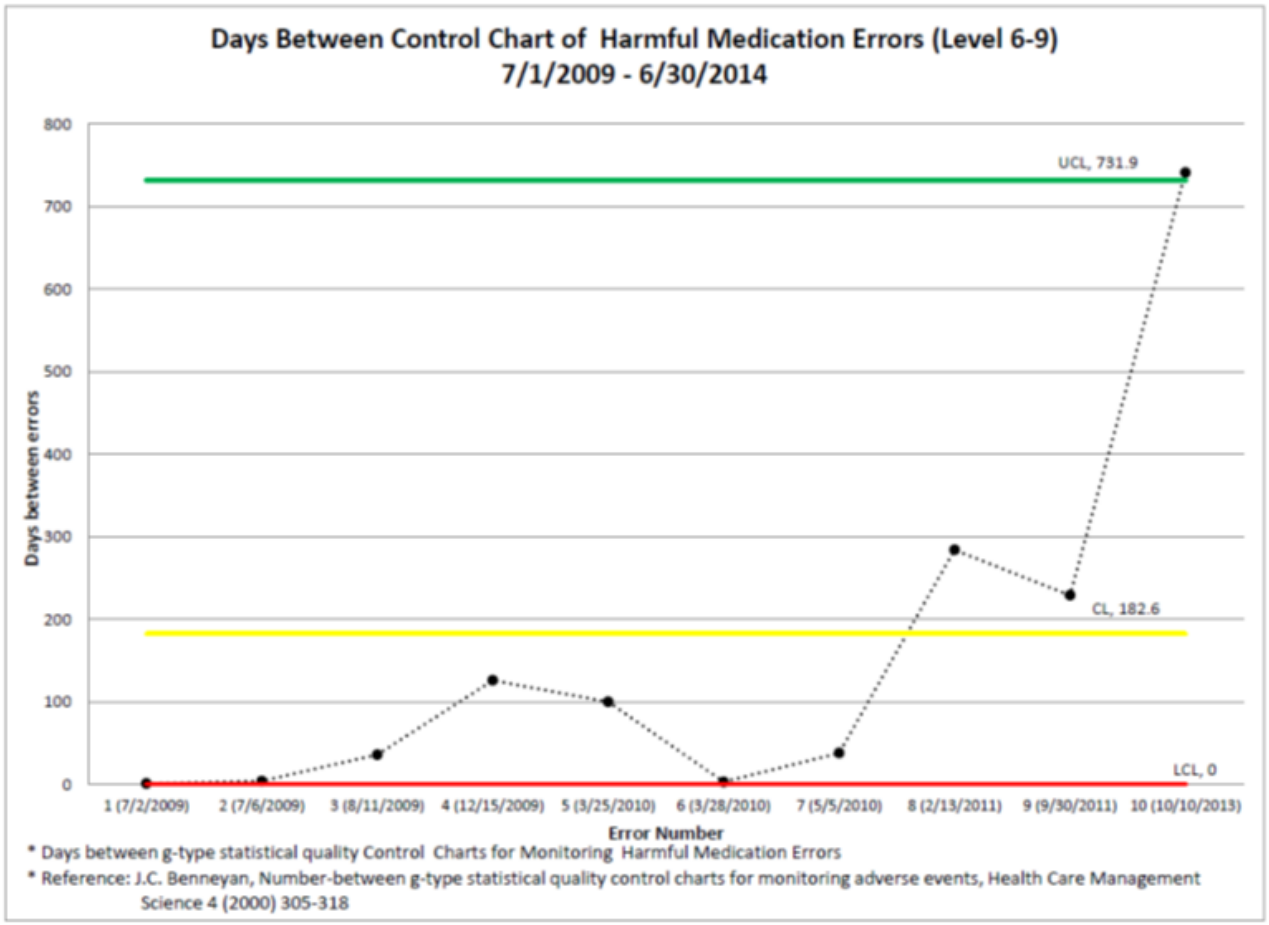

Days Between Control Chart of Harmful Medication Errors (Level 6-9)
7/1/2009 - 6/30/2014
800
700
600
500
400
300
200
100
0
Days between errors
UCL, 731.9
CL, 182.6
LCL, 0
1 (7/2/2009)
2 (7/6/2009)
3 (8/11/2009)
4 (12/15/2009)
5 (3/25/2010)
6 (3/28/2010)
7 (5/5/2010)
8 (2/13/2011)
9 (9/30/2011)
10 (10/10/2013)
Error Number
* Days between g-type statistical quality Control Charts for Monitoring Harmful Medication Errors
* Reference: J.C. Benneyan, Number-between g-type statistical quality control charts for monitoring adverse events, Health Care Management Science 4 (2000) 305-318

Figure 2

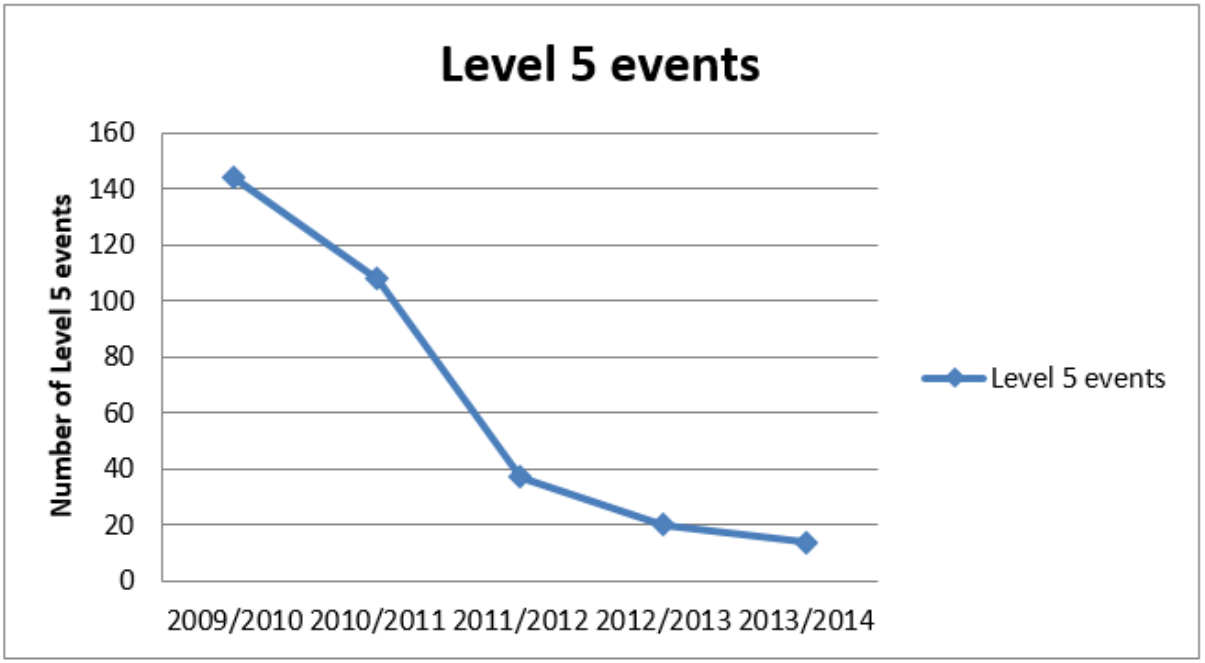
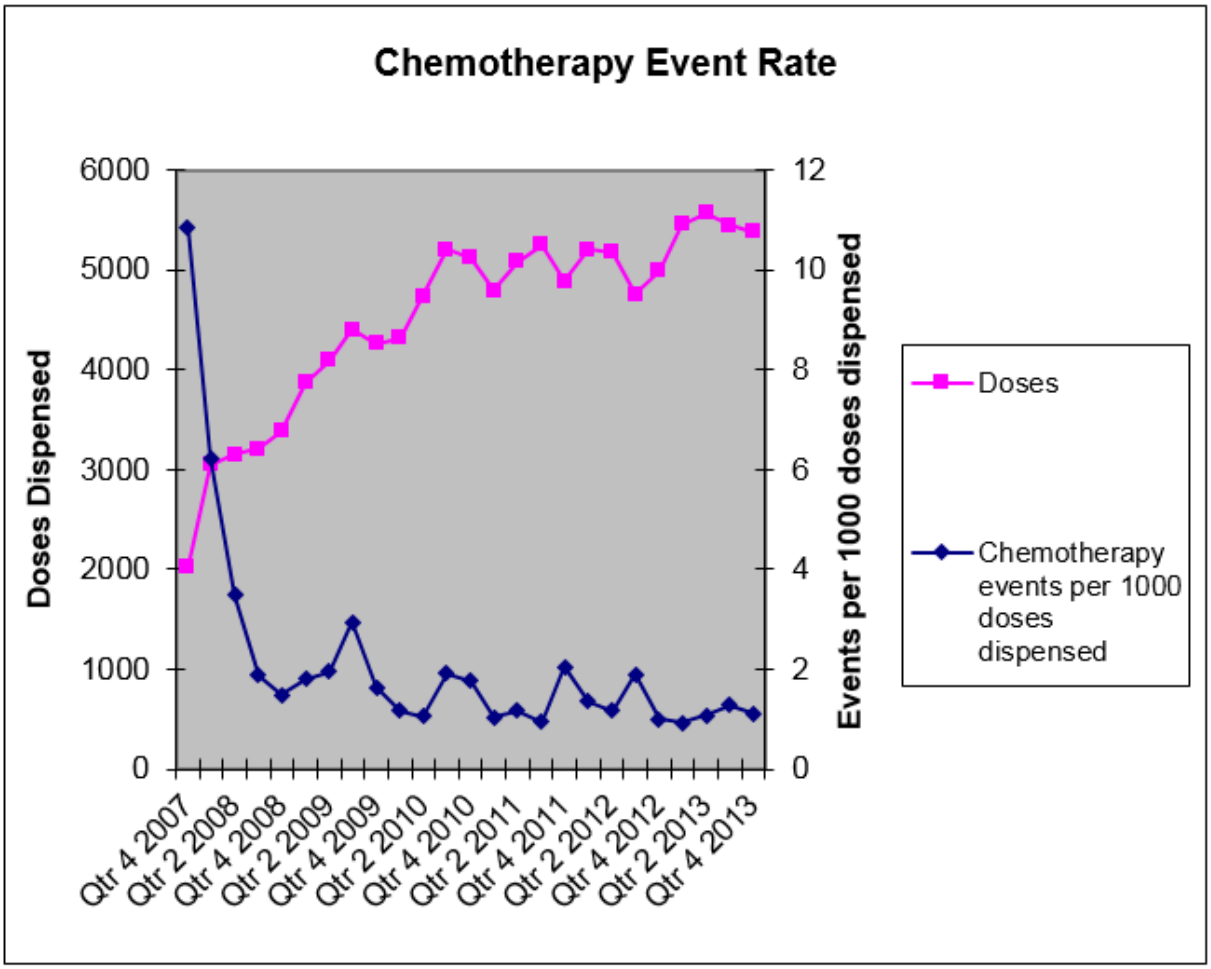

Level 5 events
Number of Level 5 events
160
140
120
100
80
60
40
20
0
2009/2010
2010/2011
2011/2012
2012/2013
2013/2014
Level 5 events

Figure 3


Chemotherapy Event Rate
Doses Dispensed
Events per 1000 doses dispensed
6000
5000
4000
3000
2000
1000
0
12
10
8
6
4
2
0
Qtr 4 2007
Qtr 2 2008
Qtr 4 2008
Qtr 2 2009
Qtr 4 2009
Qtr 2 2010
Qtr 4 2010
Qtr 2 2011
Qtr 4 2011
Qtr 2 2012
Qtr 4 2012
Qtr 2 2013
Qtr 4 2013
Doses
Chemotherapy events per 1000 doses dispensed