**Davies Enterprise Award Application**

**Date:** November 20, 2014

**Name of Organization:** University of Iowa Health Care

**Organization Address:** 200 Hawkins Drive, Iowa City, IA 52242

**Submitter Name:** Dr. Douglas Van Daele/Lee Carmen

**Submitter Title:** CMIO/CIO

**Submitter email:** douglas-van-daele@uiowa.edu/lee-carmen@uiowa.edu

---

**Core Item: Clinical Value**

**Executive Summary**

As the University of Iowa Hospitals and Clinics (UIHC) migrated from an internal developed Electronic Health Record (EHR) to an industry standard in 2009, improved patient and medication safety as well as improvement in CMS Surgical Care Improvement Project (SCIP) measures were in the forefront of our goals. Five years post go-live, we enjoy across the board improvement in those metrics. Of note:

- Substantial improvement in medication safety of Adverse Drug Event (ADE) causing harm count prior to implementation ≥ 9 annually to 2 in the two previous fiscal years.
- Adherence to pediatric immunization guidelines improved by 50%
- Anticoagulation venous thromboembolism adherence to guidelines increased 33%.
- Regulatory compliance with SCIP measures rose from 32% in CY 2007 to 96% (Inpatient) in CY 2012.
- Preoperative antibiotics order errors reduced by 71%.
- Surgical H&P compliance rose from less than 50% pre-implementation to over 98%.
- Early adoption of Smart Pump EHR integration served to improve guardrail usage which helps to avert severe harm.
**Background**

With the implementation of a new EHR, we believed a unique opportunity existed to reduce medication errors and improve patient safety overall. Inter-disciplinary teams were formed to improve safety, quality, and surgical compliance. We also strived to improve overall patient safety by using the workflows that came to us with the new EHR. A key area of focus was on our Surgical Care Improvement Project (SCIP) measures and Surgical History and Physicals (H&P).

**Local Problem and Intended Improvement**

Patient safety has been a focus of UIHC leadership for some time; however, adverse medication events and SCIP compliance were areas requiring ongoing attention. Adverse medication errors causing harm were occurring once every four to six weeks in fiscal year 2008. Surgical documentation deficiencies were commonplace in our facility. Calendar year 2007 saw an average SCIP compliance of only 32%. Pre-implementation of the EHR, the required signed paper form for antibiotics used in the OR only made it to the pharmacy 30% of the time preoperatively. There was no link between the surgery request and the actual antibiotic order.

In 2010, the hospital received a “Requirement for Improvement” (RFI) from the Joint Commission for “The hospital manages safety and security risks (PC.01.02.03)” in relation to H&P documentation.

**Design and Implementation**

Inter-disciplinary teams aimed to simplify and standardize workflows by providing proper resources, and they started a campaign to spread awareness of the importance of patient and medication safety as well as surgical documentation. The team's overarching goals:

- Reduce adverse medication errors causing harm to less than one per quarter
- Raise SCIP compliance scores to 98%
- Meet the Joint Commission measure of success goal in response to the RFI of 90%
- Decrease patient safety notifications related to preoperative antibiotic errors

Medication safety required deeper work within the EHR, but it also required rigorous review of formularies, protocols, medication use and policy, and optimization of smart pump guardrails. Workflow design relied heavily on these EHR-supported, standardized, simplified workflows but more importantly substantial provider support/education was provided around best practices both within and around the EHR.

The over-reaching goal of all projects was to adopt an “every, every, every” mentality for focused improvement. Several applications within the EHR were used to raise ongoing awareness among providers regarding risk screenings, surgical/procedural documentation as well as improve overall patient and population management.
**How was Health IT Utilized**

Health I.T. improved workflow in the following ways:

**Medication Safety**
- CPOE system notifies practitioners in real time of intervention opportunities. Warnings and contraindications incorporated into CPOE for a number of medications (e.g., ketorolac, meperidine, celecoxib), with elimination of paper monitoring
- Implemented evidence-based guidelines and practice alerts within the EHR with indications for use and dosing for drugs. Examples include intravenous immune globulin (IVIG), pediatric-specific heparin-induced thrombocytopenia (HIT), dosing of enoxaparin in obese and trauma/surgery patients, management of dabigatran- and rivaroxaban-associated coagulopathy/bleeding, argatroban, inpatient deep venous thrombosis/pulmonary embolism prophylaxis
- Automated dispensing cabinets were placed in clinics and procedure areas that did not have them in the past. Cabinet override reports were audited and a process put in place to decrease frequency of overrides.
- Transition of care warnings:
  - Patients going home on warfarin without specific warfarin discharge instructions and a followup plan have an alert that forces users to add those instructions and discharge planning
  - Alerts for physicians to evaluate drug interaction between home and clinic-administered medications.
- Ordering of high risk complication medications, such as insulin drips and heparin drips were restricted to order sets with predefined nomograms
- Refined use of smart infusion pumps: additional drugs, minimum and maximums adjusted based upon data from the pumps and EHR. We were one of the first in the country to fully integrate our Alaris smart pumps with our vendor EHR.

**Device Integration**
- We have one of the largest implementations of bedside device integration, supporting over 17 types of bedside devices in over 400 locations across ICUs, step-down units, OR, ASC, specialty procedure suites, outpatient areas, dialysis areas, cath labs, labor and delivery, and the emergency rooms. Benefits achieved include:
  - Immediate integration of bedside device data into the EHR to monitor trends and changes in the patient’s state along with other data points such as medication administrations, lab value and other flow sheet measurements
  - Saved nursing time and reduction in transcription errors.
  - Enables the patient care team to get a more complete picture of the patient both remotely as well as from the bedside.
Monitoring Capabilities

- An additional benefit of device integration is that with more measurements discreetly documented in the EHR, we can concurrently monitor patient safety metrics via the EHR reporting workbench – real-time monitoring electronically, thereby saving resources time as well as providing opportunity to quickly redirect individuals back on course.

- Within our EHR vendor’s client group, we are the largest implementation of the ICU dashboards, enabling the care team to quickly assess multiple, service-related data points at the point of care, from the nurses station and remotely.

- As a tertiary health care center, we have successfully implemented a number of tools to extend support to referring entities across the state, including robots to assist with early stroke victims and eConsults to critical access ERs, so to advise them how to safely care for the patient locally. If not, the specialty teams are already familiar with the patient and their needs at the time of the transfer.

- Radiology images are electronically transferred between the external institution's PACS and the University of Iowa PACs, avoiding delays and duplicative imaging.

Surgical Workflows

- CPOE implementation gave us the ability to use orders to schedule operating room cases.

- In the same order set which is used to schedule an operative case, a preoperative antibiotic order or notation that one is not indicated is required which helped to regulate preoperative antibiotic administration.

- The 2011 implementation of the Epic Intraoperative Anesthesia module cues that the antibiotic is administrated and documented by Anesthesia personnel during the time-out process.

- Dashboards alert clinicians if an H&P is yet to be completed. The nursing staff will not allow the patient to move into the operative suite until the H&P is completed and the icon falls off the dashboard.

- The reporting capabilities of the EHR help to monitor surgical documentation compliance.

- Alerts were put in place for patients with a Foley Catheter in place for more than 24 hours after surgery to reduce postoperative urinary tract infections.

Value/Derived Outcomes

Medication Safety Improvements

- The number of adverse drug events (ADE) causing harm dropped from ≥9 a year pre-implementation to a count of 0 in 2012, indicating substantial improvement. 
(See Figure 1)
• Consistent with other patient safety improvements experienced since big-bang go-live, house wide medication errors continue to drop. *(See Figure 2)*

**Previously using barcode scanning for MedAdmins.**

- Inpatient pediatric pneumococcal compliance with guidelines rose from <20% prior to go live to 75% post go-live.
- Although the firing rates are low, comprehensive decision support for DVT provided improvement in several categories. In particular, those with a moderate risk of thrombosis and low bleeding risk received pharmacologic treatment at a rate approximately 33% higher than previously.
- 75% reduction in supra-therapeutic INR levels in patients on warfarin.
• Being among the first in the country to integrate our Alaris smart pump with our EHR, KPI’s impacted were improvement in guardrail compliance (Figure 3), as well as safety audit enabled (e.g. bar code scanning, rate checking, reprogramming events) and feedback provided to individual clinicians.

Surgical Improvements
The campaign to increase awareness of the importance of surgical documentation along with simplifying and standardizing the workflow has increased our rate and quality of surgical documentation at UIHC. The following outcomes were a result of several years of dedication to improving surgical documentation:

• SCIP compliance rose from 32% in CY 2007 to 96% (Inpatient) in CY 2012 and remains overall in steady improvement.
• Preoperative antibiotic order medication errors reduced by 71%.
• Surgical H&P compliance rose to greater than 98%.
Through education, Patient Safety Reports of ‘On-call to OR Ordering’ errors fell from a count of averaging 7/day to now a rare event. The error avoidance is considerable savings to the institution.

Lessons Learned

Improving the quality, safety, and documentation requires ongoing optimization. It has taken many years, many talented staff, and strong leadership support to get to where it is today. During our improvement process we have learned what is effective and what is not effective in relation to documentation tools, workflows, and staff training.

The EHR was instrumental in streamlining our workflows, which we found to be imperative to gaining physician support in ways such as defaulted documentation templates with required sections, flow sheets guiding clinicians through their documentation, or adding antibiotics needed to operating room orders reduced patient safety notifications.

The EHR supported our standard, stream-lined workflow, but also important was the adoption of the “every, every, every” mentality towards workflow and documentation. The 2011- FMEA done by Operational Improvement Group further stressed in the surgical safety and documentation area:

- Providers must use order sets for all surgical case requests.
- Pharmacy workflow standardized to make up antibiotics only within 24-48 hours of the case (not earlier).
- The OR pharmacy is responsible for preparing the antibiotics for all OR patients. The inpatient units would no longer be doing it for inpatients scheduled for a surgical procedure.
- Pharmacy workflow efficiencies gained when able to monitor surgery list for case cancellations and add-ons
- An integrated EHR gave rise to transparency in the OR medication workflows, adding a layer of accountability and timeliness to the preparation of correct antibiotics for the surgical case.

Frontline staff participation in the design and implementation workgroups was instrumental to buy-in and adaptation in the resulting processes.

Implementing standardized screening and documentation tools allowed for better continuity of care across the organization and episodes of care for our high risk patients (i.e., falls, depression, and suicide risk).
Use of the EHR and imbedded dashboards make the information readily and visually available to frontline staff, which results in improved outcomes and compliance.

**Financial Considerations**

The expenses associated with the needed workgroups, system design, and end-user training were included in the overall implementation costs.

The cost of integrating bedside devices was $2,400 per device. With reduction in staff time to complete manual entry tasks, the following three items reflect estimated savings over a 5 year period:

- Monitors - $37 million
- Ventilators - $1.9 million
- AccuChecks - $1.4 million

Medication errors have an inherent financial risk and their avoidance has a strong relationship to the financial health of the institution. Adverse drug events in hospitalized patients: excess length of stay, extra costs, and attributable mortality. Based on a conservative estimate of $2,595 per ADE with an increase in LOS of 2.2 days,* the UIHC savings from reduced medication errors over five years is estimated to be $7.2 million.


The financial ramifications for not achieving our SCIP measure targets would be the risk for 1.0% decrease of base operating Diagnosis-related Group (DRG) amounts for the FY 2013 Program. As required by the statute, that percentage will rise to 2.0% by FY 2017.

If unable to be compliant with our Joint Commission requirements (such as timely H&Ps), we risk our Joint Commission accreditation, which would make us no longer eligible for federal grants, or Medicare and Medicaid payments.