

Integrated Technology: Strengthening the Foundations of Patient Safety

Background knowledge:

The Centers for Medicare and Medicaid Services sponsored a study by the Institute of Medicine (IOM) with the goal of developing a national agenda for reducing medication errors. The study estimated that on average, a hospital patient is subject to at least one medication error per day. The study also indicates that at least a quarter of all medication-related injuries are preventable.¹

The IOM study recommended that technologies for acute care target prescribing by computerized provider order entry with clinical decision support, electronic medication administration records which can improve documentation of what medications have been given and when, as well as barcoding and smart IV infusion pumps. The study concluded with a recommendation that all these technologies be linked electronically.¹

Norwood Hospital, a member of the 6-hospital, Caritas Christi Health Care System, is a community hospital located in the greater Boston area. Norwood has 264 licensed beds which include ICU, medical, surgical, pediatrics, maternity and psychiatric services. The hospital has an outpatient and inpatient surgery program as well as cardiac catheterization on-site.

Norwood hospital was the first in the system to launch an advanced electronic medical record, electronic Medication Administration Record (eMAR), electronic bedside medication verification (BMV), and Computerized Physician Order Entry (CPOE).

Local problem:

Norwood recognized the need to plan for electronic medical record, closed loop medication administration and CPOE as well as replacing an aging IV pump fleet with state-of-the-art integrated safety software.

In 2004, Norwood Hospital developed an evidence-based hard copy algorithm for weight-based heparin therapy. Documented outcomes of algorithm use were decreased time to therapeutic aPTT and improved workflow for nursing. The paper protocol addressed issues related to legibility, dangerous abbreviations, and RN double check compliance. One of the objectives of the implementation of integrated electronic technology was to safely transition all steps of the existing protocol.

Intended Improvement:

Norwood Hospital employed a strategy of a collaborative, multidisciplinary team to systematically redesign practice and technology. The foundation of this redesign was already in place and included: a well-designed, well-defined hospital formulary; Pyxis medication vending; computer-generated medication administration record (MAR); weight-based heparin management; and evidence-based pre-printed order sets. The migration to integrated technologies could not be at the expense of these well-designed systems.

¹ Preventing Medication Errors: Quality Chasm Series, Committee on Identifying and Preventing Medication Errors, Philip Aspen, Julie Wolcott, J. Lyle Bootman, Linda R. Cronenwett, Editors National Academy of Sciences.2007.

Planning the intervention:

In 2006 the Caritas Christi Health System embarked on the implementation of a fully electronic medical record, CPOE, “Smart Pump” technology, and BMV. Norwood Hospital was the first hospital in the Caritas Christi Health Care System to go live with these new technologies. Core Teams were formed at the system level and at the local hospital level that consisted of representatives from Medicine, Nursing, Pharmacy, Information Technology and ad-hoc members as necessary. These teams were responsible for designing and testing of the system and planning the implementation sequence. Thorough testing of the advanced clinical system by both computer analysts and clinicians was followed by house-wide training. The maternal-child health unit was selected as the pilot area to implement PCS, BMV, eMAR and CPOE because it is a small specialized unit where the patients do not transfer throughout the hospital.

During this time the hospital established an interdisciplinary Build Oversight Committee charged with transitioning the existing evidence-based protocols and order sets into the electronic environment. A separate group was charged with identifying policies which needed to be changed or updated to reflect the new practices.

Training for staff was challenging due to the number of staff to be trained as well as challenges with changes to the workflow. Specifically related to heparin weight-based therapy, licensed independent practitioners (LIPs) required training in CPOE, nursing required training in order acknowledgement and documentation, pharmacists required training in order management and verification, and lab required training in order management. To optimize training as close to live as possible, a team of “super users” was trained and was essential in supporting the implementation. Super users were available 24/7 on all units.

Health Information Technology (HIT):

Caritas Christi Health Care System had been utilizing the Meditech Client Server system for lab results and patient registration. Therefore, Meditech Client Server version 5.54 was chosen for Advanced Clinical Applications. We currently utilize the EMR, PCS, BMV, eMAR, and CPOE modules in Meditech.

Features that were utilized in our transition included:

- Verification of order sets using Zynx evidence-based guidelines
- Condition specific (VTE/ACS or CVA) order sets
- Utilization of the Alaris smart pump platform
- Trending and graphing of data in the electronic medical records

Documentation requirements were developed to capture necessary core measure data elements. Additional safety features included electronic bedside medication verification documentation which included the double-check for all high alert medications.

Outcomes (Nature of setting and improvement intervention):

Norwood Hospital has a culture of safety shared by leadership and staff. That common value and dedication to patient safety paved the way for the rapid change in technology experienced in the last two years.

In the process of planning for the Advanced Clinical Applications, it was identified that the IV delivery system did not support best practice. Further evaluation identified that smart pump technology should be in place prior to go-live of eMAR and BMV.

The Alaris smart IV pump with Guardrail platform was chosen after thorough end-user evaluations. At every stage of planning for the smart pump implementation, pharmacy, nursing, environmental services, materials distribution and leadership were involved in the process. Pharmacy & nursing collaborated closely on the database build with frequent reviews by both to align best practice across disciplines. The transition to the Alaris pumps in February 2008 was facilitated by outstanding customer support provided by the vendor. This support took many forms including a comprehensive database review by the vendor as well as knowledgeable and attentive support staff.

In June 2008, the planned implementation of the advanced electronic medical record began with PCS, eMAR, and BMV. A phased roll-out of PCS followed by eMAR and BMV occurred over a 3 month period to all inpatient units.

Between January and March 2009, CPOE was expanded through a phased roll-out.

Lessons learned:

- Physician involvement in order set development worked most efficiently when they were presented with a draft order set to evaluate instead of requesting the physicians to develop their own order sets
- Trainers available in the Medical Staff Office were more effective in reaching a larger audience than scheduled training sessions
- The training and deployment of “super users” for the different technologies created resources at the point of use which continue to be utilized post-implementation
- With our current technology, we still maintain a paper documentation tool that aggregates both the laboratory data and medication rate changes

Outcomes (Changes in processes of care and patient outcomes associated with the intervention):

The following care measures may be indicative of early success:

- Alaris pump dictionary compliance – 97%
- Medication and Patient scan rates – 93% monthly average
- Patient BMV scan rates – 94% monthly average
- CPOE inpatient utilization – 85% (current national average of 75%)
- 92% decrease in illegible orders with CPOE
- Projected 52% decrease in order clarification interventions by Pharmacy in fiscal year 2010.

Barriers Encountered/Challenges Faced:

- Time commitment from nursing and pharmacy to align Alaris dictionary with best practice
 - The decision to implement the Alaris platform was universally supported by the institution. There was an identified leader that worked consistently with all participants. Implementation would improve patient care and all participants were dedicated to a comprehensive build, educational process and go-live.

- Limited practical decision support to guide clinicians
 - Initial weight-based heparin order sets transferred to the status board and the eMAR but were not functionally connected with the nursing worksheet. Revision to the order sets resulted in a standing worksheet flag for the duration of the heparin therapy.

Summary and Conclusions:

In summary; we translated an already successful process into an integrated electronic system. We incorporated the electronic technology available with Alaris and Meditech to maintain a safe and effective anticoagulation protocol. We now have consistent documentation of complete heparin orders inclusive of indication because greater than 99% of weight-based heparin orders are placed through CPOE. Norwood's 97% compliance with the Alaris pump guardrails is well above the industry average. Advanced integrated technologies are not a panacea but have the ability to help us care for patients safely.

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There were no external funding sources for this project.