Trends in Clinical Informatics: Poster Presentation
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MyICU: Introducing a Web-Based Patient Engagement Tool to the ICU

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eMAR Forensics: Surveillance & Investigation

Emily Keenan, RN, BSN, Jean Campbell, RN, MS, Tricia Bourie, RN, MS

Background

The transition from paper to electronic documentation requires committed participation and engagement from leadership. Equipping leaders to act as agents of change and champions of best practices requires education and support that differs from that provided to end-users.[1] Following the implementation of an electronic Medication Administration System (eMAR), we developed an eMAR Forensics course that introduced leadership team members to new ways of seeing and investigating documentation.

Methods

In August 2013, we began the systematic process of rolling out our homegrown eMAR to our medical center, unit by unit. In preparation for each roll-out, all nurses, including unit leadership, attended hands-on training classes. Although the classes provided adequate training for front-line staff, leadership team members interact with the eMAR differently and needed more specialized training. Performing chart audits, monitoring practice, and investigating medication incidents requires a deeper understanding of how the eMAR functions and new investigative tools.

Drawing from incident report data and eMAR user feedback, we developed and held *eMAR Forensics* classes that introduced tools for surveillance and investigation, with the following goals:

- To obtain an overall situational awareness of staff performance in relation to medication administration
- To troubleshoot eMAR roadblocks on a unit-level
- To fully understand the eMAR and perform thorough chart investigation
- To reduce the need for external support in investigation

In these classes, we simulate an "error-filled" eMAR for demonstration and provide dedicated time for questions and specific events or concerns to be addressed by the eMAR team.

Results

From the fourteen live units, 65% of the nursing leadership attended one of the four classes, including nurse directors, nurse specialists, and unit-based educators. Each unit was represented.

Discussion

Attendees reported an increased understanding of chart surveillance and decreased length of time spent hunting through the records during investigations. Leaders reported increased engagement, championing best practices, and fewer work-arounds. We will offer these classes to leadership teams on new eMAR units and new nurse leaders, revising class format to facilitate class preparation. We will make content of classes accessible to users on an ongoing basis.

Maintaining Adolescent Access and Confidentiality with a Custom Patient Portal

Elizabeth Bennett, BA, Irene Chen, BA

Introduction

In 2013 the MyChildren's Patient Portal was launched at Boston Children's Hospital. MyChildren's is a homegrown application with over 41,000 users, providing patients and families with web access to portions of their health record. Users can access clinic notes, lab results, diagnostic studies, billing information, and send messages to providers. To meet the needs of pediatric patients (as well as government regulations), MyChildren's has been enhanced so that patients 13 years old and over can access their records with additional confidentiality. This functionality was added in June of 2014.

Methods

To meet the needs of adolescent users, the MyChildren's team uses the same validation processes that already existed for all end users. Patients are able to begin the account validation process at their ambulatory visit by asking for a "token" that confirms their access request. User provisioning is strongly monitored and if created incorrectly, portal access is not granted. At the request of our legal team, MyChildren's sends notification to the parent of patients aged 13 or 14 informing them that their child has access to their own health information. Adolescent access allows patients to view confidential visits that are filtered. To increase patient sign up, the MyChildren's Support Team has worked with the Adolescent Clinic to train staff on how to promote the portal to patients.

Results

As of February 2016, there are 393 adolescents accessing their own portal accounts. Interest among adolescents has steadily risen since the June 2014 launch. Access to the portal brings health records directly to the patient and they are no longer obligated to go through our Health Information Management Department. With access to their information directly through the internet, adolescents are engaged in their own care in a new way. In addition, if they continue their care at BCH (and beyond) once they are over 18, having access to their records allows for familiarity in their transition to adult care. Conversations among the Support Team and clinic staff provide information that will help with future upgrades to MyChildren's, thus creating a better user experience for patients and parents. This engagement also lends help to other hospital initiatives regarding access.

Conclusion

We anticipate that as the user base expands, different needs will arise. MyChildren's will need to adapt to meet those needs. To continue to increase the portal user base and meet the needs of users, the Support Team will need to engage patients through our Adolescent Clinic, Family Advisory Council, and the Hale Center for Families.

Improving Efficiencies in ED Triage Documentation

Lee Williams, PhD(c), RN-BC

Introduction/Background:

The initial implementation of the EHR at our institution in 2007 required design and build of documentation forms and flowsheets used by nurses. These included those used in the Emergency Department (ED).The forms were used at several points of care in the ED, such as at triage and at the RN initial assessment. A bi-weekly ED interprofessional meeting determined that the forms and documentation methods were causing nurses to document duplicative information as well as more details of assessment than were necessary.

Methods

In collaboration with the ED Clinical Nurse Specialist (CNS), the Clinical Informatics Specialist (CIS) completed an analysis of the existing Nursing Triage Form. The form had initially been designed to mirror the extensive inpatient nursing admission physical exam head to toe assessment. The inpatient unit nurses use the flowsheet documentation method, where the option to select nomenclature such as "within normal limits" is more available. This functionality was not available to the ED nurses. The CIS designed a section of the triage form that would allow for expedited assessment documentation, prompting the ED RN to more comprehensive assessment details only where needed. The form design was reviewed and approved by the ED CNS. ED nurses were informed of this change through verbal and email announcement supported by reference material.

Results

Post implementation, the ED CNS reported satisfaction from the ED nursing staff. The staff reported that the changes to the existing form were easy to use and also led to more efficient documentation during the triage. Staff also requested that additional forms used by the ED nursing staff be assessed and re-designed.

Discussion/Conclusion/Lessons Learned

The reality of informatics and our electronic health record is that it will continue to require change to support new innovations and advancements in the healthcare environment. As often these demands and advancements require additional change into our record, it behooves us as informatics specialists to continue to actively assess the existing tools in the EHR for opportunities of revisions and efficiencies.

Improving the process for capturing Resuscitation Status & Discussion

Tim O'Connor-Crowe, CPhT, MPH, MSHI

Introduction/Background

End of life care is a very sensitive topic. Clarity in the capture and communication of advance directives is crucial. The former process for capturing this information was disjointed and lacked the detail around those items so personal to the individual. The process included an order for status, a form that would be filled out with basic information about what should/shouldn't be performed and an unstructured note to capture some details about the discussion. This was problematic because not all of the information was properly housed in one place.

Methods

Through many design sessions, the team constructed a new process which would allow for any clinician to document the information that the patient/family presents. This information is broken down into three sections:

Details of the status: Broadening the availability of items pertinent to the resuscitation status; Dialysis, artificial nutrition and artificial hydration have been added to the options, in addition to fields which allow for the patient/family to specify wishes that might not be part of the standard options.
Discussion: Replacing the separate note option, this section drives the user to document not only the details of the discussion, but also the participants in the discussion (which wasn't always captured previously). The addition of a field for MOLST (Massachusetts Orders for Life Sustaining Treatment) allows documentation of whether the patient has orders outside of the institution.
Removal: A special section which allows for documentation of status to be removed from the chart (alerts no longer appear) if and when the condition of the patient changes and they no longer want/need the status that was documented.

Further improving the process, the indicators for the status are presented to the end user at the time of entering the patient chart. They are also available on a special patient information page, and in a structured text document within the patient notes folder.

Results

Feedback from end users has highlighted that this new process has allowed for a more streamlined process for all users to be able to assist in a very sensitive time in the patient care experience.

Discussion/Conclusion

Most people want their wishes about end of life care to be clear and well known by those providing care to them. [1] This new system of capturing the information helps to ensure that the information is appropriately captured and presented to the end user, satisfying both of these requirements.

Improving Education in Informatics Based on Learner Feedback.

Tim O'Connor-Crowe, CPhT, MPH, MSHI & Jared Nager, MPH

Introduction/Background

To promote full effectiveness of the educator, a learner feedback system was put in place. Surveys were utilized to get users' opinions on a particular educational session. We learned that through very little effort on the part of the end user (a quick one or two minute survey was not very time consuming for either) the output from these gave each a unique opportunity. The learner was able to express what they felt worked and the educator had opportunity for reflection on their methods.

Methods

Two significant outcomes came from implementing these surveys. The first was that educational sessions were not being presented in a manner conducive to varying work schedules and environments. Given that individuals learn differently, the one size fits all approach to education is not effective.[1] In order to be sure to meet the needs of all types of learners we sought to get the education to the end user in the most convenient manner possible. Web-based asynchronous learning sessions were offered in order to promote the educational experience that would be efficient for users in a variety of locations. The secondary benefit of this type of education is that it afforded the opportunity to users to be able to learn at their own pace. Pre-recorded sessions provided the ability to stop the session, and give thought to what was being taught. In this manner the educator became more effective, and opened up time and opportunities for other educational needs.

One of the other items that came from these surveys was that other learners often disrupted the session. One of the simplest and yet impactful tools introduced in this process was a visual aide which was developed and displayed prominently in training locations to promote effective learning. The tool, based on "The Ten Commandments of Effective Meetings"[2] provides six habits of a highly effective learner.

These six habits include:
Commit to the Situation: Being on time and being 'present'.
Prepare to Engage: Be ready to focus and not only hear but listen.
Tune In: Minimize outside distractions.

Show You Are Listening and Understanding: Body Language.
Defer Judgment: Separate the message from the messenger.
Respectfully Ask and Share: Keep in mind others are there to learn as well.

Results

Through the post session surveys, it was found that the outcome from these two changes has been a more engaged set of learners and a more effective team of educators.

Discussion/Conclusion

Based on the results of this work, the team feels that this is a highly effective approach and can be used to improve upon other educational offerings provided by the hospital as well as utilizing the six habits and applying them to other areas (meetings, committees, etc.).

Managing Risk in a Legacy System in a Small Community Hospital

Corrine Keach, RN, BSN, Stephanie Colman-Brochu, RN-BC, MS

Introduction/Background

Milford Regional Medical Center (MRMC) is a 145 bed community hospital that has used Meditech Magic EMR for over 25 years. Nursing documentation was introduced in 2007, EMAR in 2009 and CPOE was implemented in 2010. The adoption rate for CPOE has been high. In 2015, ninety two percent of the orders were placed in the EMR by the provider. An order entitled, "Notify Nurse", was built in the initial implementation that allows for free text. Leading patient safety organizations have cautioned against the use of free text orders. The "Notify Nurse" order as free text order bypasses many safety features built within system.

The discovery of potential issues in the design and usability of the system at MRMC was realized through a proactive approach. In early 2014, the "Notify Nurse" usage was measured by the informatics department. The number, types, details of and use of this order were categorized and analyzed over a 3 month period. The results were presented to several key committees. The informatics department with support from leadership established a goal to reduce the use of and then safely eliminate the "Notify Nurse" order.

Methods

Monthly the Notify Nurse orders are reviewed. Categories and trends were analyzed. Orders categorized as medication type were the third highest type of Notify Nurse placed and were considered to have the highest risk. Priority was given to reduce the number of medication type orders. Orders categorized as communication type were the highest volume of Notify Nurse orders.

The PDSA methodology was used to implement iterative changes in cycles. Several cycles were done through 2014-2015 to reduce the numbers and types of Notify Nurse orders placed. Cycle activity included working with individual high utilizers, aliasing orders, leveraging clinical decision support, increasing awareness and creating new orders and workflows.

Results

Table 1: Overall reduction in Notify Nurse orders placed

January 2014-October 2015	January 2014	October 2015	Percent reduction
Overall number placed/month	661	348	47%
Medication type	87	16	81%
Existed in system	97	50	48%
Lab type	36	10	72%
Miscellaneous	422	272	35%

Discussion/Conclusion

The Notify Nurse order continues to be used in the system but with less frequency. A risk still exists for it to be used improperly. Overall the number of Notify Nurse orders have been reduced especially the medication type. Communication continues to be the leading category placed. Technology is being investigated to facilitate nurse: physician communication. Work continues to be done to further minimize the number of these orders placed and eventually remove the order without serious impact to clinician workflow and patient care.

The Use of Tablet Technology for Real-Time Patient Feedback

Leslie Hutchins MBA, BSN, RN, Carol Salerno BSN, RN

Introduction/Background

To obtain real-time patient feedback during the hospital stay or ambulatory visit, we implemented a tablet technology and software which allowed the patients and families to easily communicate compliments and opportunities for improvement. The goal is to positively impact patient satisfaction as measured by HCAHPS, and provide staff with an effective, real-time opportunity to assess patient feedback, intervene and remedy issues as they arise.

Project Description

Using a vendor supplied application named "Humm", real-time feedback analytics is provided and allows patients and families to give instant feedback with the use of a tablet during their hospital stay or at the end of their ambulatory visit.
The patient is provided with a tablet on a daily basis during their hospital stay. The key features for the use of this tool are:

- Fast, simple, customized questionnaire
- Brief encounter related to the patient experience (4 - 5 questions that take less than 60 seconds to complete)
- Instant email/text alerts for both comments and opportunities.
- Live dashboards in the clinical setting, available for viewing the real-time feedback by the interdisciplinary care team.
- Leadership access to the Humm Insights portal for custom reporting/data analysis

Project Methods

The tablet technology was initially piloted for use on a single unit for 1 year. Following this introduction into the clinical setting, YNHH Leadership designated this tool as a key component to assist with the hospital initiative to improve the Yale-New Haven Hospital (YNHH) patient experience and Press Ganey scores.
The Project Team met with the designated pilot units (medical, surgical, pediatrics, ambulatory, and lab draw stations) starting in August 2015 to introduce the product and workflow for use in the clinical setting.
The Project Team assisted with:

- Configuration of the standardized questions for in-patient, outpatient, pediatrics, and the lab draw station allowing for the unique environment/clients in each setting.
- Designating the number of tablets and charging station placement for the unit/department
- Hardware Installation: Unit Dashboard Placement
- Script for staff to utilize when distributing the tablet/questionnaire
- Alert notification process for weekday and weekends
- Access for Directors, Managers, and Assistant Managers to the Humm Insight portal

Weekly Webinars were scheduled for the participants to provide feedback and obtain additional support as needed to sustain the implementation on their unit/department.

Results/Conclusion

The table technology tool provides real-time results for real-time service recovery. The unit/department leadership team is notified when: the score is below 60, the comment is either an opportunity or a request through the use of tools that query the content and able to denote the comment sentiment (positive, negative, request).
This quality improvement tool requires a daily workflow to establish a system to address low scores and opportunities, and most importantly on how to handle the feedback with patients/families, and staff.
The team immediately recognized an opportunity for real-time feedback to go directly to the appropriate resource for real-time resolution. The project team set up a direct notification process for Environmental Services to address the feedback for hospital cleanliness.

Real-Time Feed-back + Real-Time Analytics + Real-Time Service Recovery = Improved Patient Experience

Development and Validation of the Nursing Informatics Competency Assessment - Nurse Leader (NICA-NL)

Po-Yin Yen RN PhD, Andrew Phillips RN PhD, Mary K Kennedy MS, RN-BC, Sarah Collins R.N., PhD

Please see author for additional detail

Development and Pilot of MySafeCare: An Application for Patients and Family to Report Safety Concerns in the Hospital

Sarah Collins RN, PhD

Please see author for additional detail

Structured Data Elements Optimization: Challenges & Mixed-Methods Data Driven Approaches

Sarah Collins, RN, PhD[1,2,3], Emily Gesner, DNP, RN-BC[1], Perry Mar, PhD[1,2,3], Doreen M. Colburn, RN, MSN[4], Roberto Rocha, MD, PhD[1,2,3]

Introduction/Background

Electronic Health Records (EHRs) promise to enable information exchange across health systems and serve as a mechanism for contributing to a continuous Learning Health System.[1,2] These goals are directly dependent on semantically interoperable EHR systems that can transmit the meaning of the data in a standard format. Semantically interoperable EHR systems require fully specified and consistent clinical data definitions preferably with terminological references for each structured data element.[3] The work to achieve fully specified and consistent clinical data definitions with terminological references for each structured clinical data element (CDE) is significant and best if done early in the lifecycle of an EHR implementation to prevent inconsistent data capture and misuse. Yet, early in the lifecycle of an EHR implementation is a resource intensive time with few available resources for optimization of CDEs, increasing the challenges inherent in this work. This abstract will outline mixed methods to prioritize clinical topics for optimization of structured data elements using data driven approaches.

Methods

Our team identified resource and prioritization challenges to optimizing CDEs and defined a mixed-methods data driven approach to overcome these challenges. This abstract extends our 10 step approach for a data governance and optimization process that: 1) identifies clinical topics, 2) creates draft reference models, 3) identifies downstream data needs, 4) prioritizes clinical topics, 5) validates reference models, 6) calculates gap analyses of EHR CDEs, 7) communicates validated reference models, 8) requests revisions to EHR CDEs based on gap analysis, 9) evaluates usage of reference models, and 10) monitors for new evidence.[4] We extend this work to describe our mixed-method data driven approach to prioritize clinical topics (step 4) by requiring three criteria are met: 1) high downstream data needs, 2) high usage rates, 3) low consistency in data definitions across EHR system.

Results

In this poster we will describe findings from our mixed methods analyses for 7 clinical topics. We detected a wide variation in usage rates of CDEs across clinical topics. For example in appying our critieria, we found that while Pain Assessment CDEs were used at a lower rate than Skin Alteration and Lung Exam CDEs, Pain Assessment had the most significant downstream data needs and low consistency of CDEs.

Discussion/Conclusion

A lack of resources is a significant challenge to optimizing EHR CDEs early in the implementation lifecycle of an EHR. Challenges to EHR optimization increase overtime as a lack of project resources persist and the complexity of optimizing CDEs that are in a production EHR system with data filed increases. Balancing data from 3 criteria was successful in efficiently identifying high priority clinical topics for optimization in the setting of limited resources.

ICU Staffing Ratios Using an Acuity Tool

Andrea Santos RN, BSN, MSHI, Diane Menasco RN, BSN, MSHI

Introduction/Background

North Shore Medical Center had been using QuadraMed AcuityPlus, an acuity tool since 2002, as well as the Assignment Feature since 2013 to create Medical/Surgical nursing assignments. QuadraMed AcuityPlus is used by all Partners acute and rehab hospitals for tracking patient acuity. However, not all Massachusetts Health Policy Commission (HPC) regulations could be met using the existing version of QuadraMed. For example, the system could not denote whether the patient should have a 1:1 or 1:2 ratio for nurse assignment. This is required by Massachusetts law.

Methods

Partners QuadraMed Council met for a strategy session with QuadraMed developers. A new version of the tool was drafted using input from the Partners Council that included input from NSMC charge nurse interviews and lessons learned. QuadraMed provided an update to AcuityPlus that NSMC Beta tested in December 2015. NSMC implemented the QuadraMed update in February 2016. In March 2016 the ICU implemented the assignment feature for patient ratios in accordance with HPC requirements. QuadraMed Acuity Plus uses an objective classification process using twenty four indicators to quantify patient care needs for the next 12 hour shift. Nurses are required to complete a classification on their patients based upon the patients' anticipated care needs for the next twelve hours. This calculates the patient's workload for direct nursing care, which is used to determine nurse-to-patient ratios for the ICU nursing assignments.

Results

The assignment feature uses the selected indicators for each patient to calculate patient workload. The patient workload is then used to determine the patient ratio, 1:1 or 1:2 assignment for the ICU nurse. The patient ratios are denoted next to a patient name with R1:1 or R1:2. In addition to using ratios other factors including continuity of care, isolation patients, and environmental factors, such as the physical layout of the unit are taken into account when creating nursing assignments.

Discussion/Conclusion

In using the enhanced version of QuadraMed AcuityPlus, NSMC is meeting the current HPC regulations. Details for public reporting have yet to be finalized by the HPC. The assignment feature is meeting the goals of the ICU staffing committee and the ICU staff nurses.

Benchmarking Barcode Medication Data

Diane Menasco, MSHI, BSN, RN, CPHIMS; Andrea Santos, MSHI, BSN, RN;

and Sarah Collins PhD, RN

Please see author for additional detail

Non-Oncology Infusion in an Electronic Health Record

Amy Silver, RN, MSN

Introduction/Background

This project was designed to bring ambulatory non-oncology infusion practices associated with multiple hospitals away from differing electronic and paper systems onto one enterprise-wide vendor electronic health record (EHR). Integrating non-oncology infusion practices into an EHR presents unique challenges. EHRs tend to be set up for ambulatory, oncology, or inpatient modules, but infusion centers are a unique hybrid of each of these modules. For example, they require an inpatient type medication administration record (MAR), but are considered non-hospital locations. In addition to the technical uniqueness of non-oncology infusion, implementing an infusion process into an EHR is challenging because infusions are inherently risky and often involve medications used for chemotherapy.[1,2]

Methods

Ordering providers, practice managers, and nurses were interviewed to determine infusion workflows. Questions for practices included what medications are infused, what medications are administered along with the primary infusion, how are patients scheduled, how are prior authorizations obtained, who obtains the prior authorizations, how should patient monitoring be documented, will medications be supplied by and verified by a central hospital pharmacy, and who will administer infusions. Infusion medications and their associated orders were placed into therapy plans. A restricted access website was utilized for stakeholders to comment on the contents of each therapy plan. A clinical content governing body helped to mediate differences in stakeholder opinions. Workflows were designed for providers to order plans both inside and outside of scheduled appointments, since treatments typically recur on specific intervals, and infusion nursing obtained its own workflow due to unique monitoring and documentation needs.

Results

Prior to go-live, considerable workflow variation was found between infusion centers and ambulatory practices and among different ambulatory practices, as well. There were differences in opinion over therapy plan, activity menu, and monitoring flowsheet contents. After the first go-live, merging plans, expiring plans, outside ordering providers, and whether or not a provider should manually enter a new weight prior to ordering an infusion medication, were some of the initial incidents. In addition to these issues, there were scope creep concerns. Ambulatory departments were uncovered that gave a small number of medications that required an inpatient MAR and an infusion-like setup, without actually administering infusions.

Discussion/Conclusion

Application coordinators responsible for preparing an organization for the integration of non-oncology infusion workflows into the EHR should have a tightly defined project scope and be cross-trained in at least ambulatory and oncology modules of the EHR. The questions outlined in the methods section represent a strong starting point and should be utilized. Prior to go-live, the team should determine if any infusion practice is receiving orders from providers outside of the healthcare organization. If these outside provides will not be accessing the new EHR, a workflow involving order transcription may be proposed. Given the risky nature of infusion medication, a physician, nurse, and pharmacist should verify medication order details and therapy plan contents. When multiple practices or centers will need to agree on process and contents, it is imperative to have a governing process in place.

Evaluating Clinical Decision Support Fire Rates to Guide Activation Decisions in the Production Environment

Karen Bavuso, RN, MSN[1*]; Shirley Xiang Fei RPh, Pharm D[1], Elisa Dell'Oglio, MSBE[1]; Charles Lagor MD, PhD[1;] Eileen Yoshida, RPh, MBA[1]; Saverio Maviglia, MD[1,2,3,]; Roberto A. Rocha, MD, PhD[1,2,3]

Introduction

At Partners Healthcare the Clinical Informatics (CI) team develops and maintains Clinical Decision Support (CDS) interventions utilized within a commercial enterprise Electronic Health Record (EHR). CDS development occurs in ongoing phases from request to implementation, known as the "CDS lifecycle". [1] The CDS Committee provides governance over the release of CDS interventions. These interventions consist of various types of CDS, targeting a variety of intended recipients at different points within the workflow. Over-alerting may increase the risk of alert fatigue and cause providers to ignore important CDS interventions. The behavior of CDS interventions should be evaluated early, even prior to activation when possible, in order to identify and correct potential problems before the end user is exposed to false alerting.[2] The aim of this project was to develop a mechanism to evaluate CDS fire rates to guide decisions for activation in the Production environment. Inherent functionality within the EHR exists, enabling CDS interventions to be set in a "silent" mode, thereby allowing for an analysis of CDS activity prior to full activation.

Process

Clinical Informaticians and Knowledge Engineers were involved in the development and implementation of a pre- and post-activation process for evaluating CDS alert rates and follow-up actions. The process was designed to be an efficient and consistent way to review CDS fire rates to guide go-live decisions. Evaluation of firing rates prior to activation is intended to identify any unusual or unanticipated firing activity thereby allow for an adjustment prior to activation. The process also allows for the documentation and tracking of CDS Committee decisions as well as any required follow-up actions before or after activation.

Tools

To monitor the CDS interventions, alerting data from the EHR system are uploaded to a SQL Server database on a daily basis. The daily extracts from the production environment ensures a review using the most up to date CDS firing activity data. Customized queries aggregate the data from the SQL Server, and are visualized as graphs in a CDS monitoring tool. A link to a CDS specific firing activity graph was added to a separate CDS tracking tool. We use a dashboard within the CDS tracking tool to organize our pre- and post-activation evaluation activities, enabling an efficient weekly review and recommendation to the CDS Committee. Each CDS is evaluated for at least 14 days prior to activation.

Discussion

The pre-activation monitoring process has been implemented and is serving its intended purpose. The ability to monitor the fire rate of CDS interventions prior to activation is extremely valuable to proactively identify inappropriate fire rates. Designing a method to efficiently capture and display fire rates for each CDS intervention was challenging. The team recognizes that this is an iterative process and the recent adoption will guide further stepwise improvements. Further enhancements include visualizing CDS life cycle milestones, visualizing expected fire rates and anticipating user behavior that would facilitate decision making prior to activation.

Building Consensus for Electronic Charge Report

Caitlin Guerrero, RN, BSN, OCN1, John Solman, RN, BS1, Roberta Viens, RN, BS1, Theresa Jasset, RN, MSN, CNOR1

Introduction/Background

In May of 2015, Brigham and Women's Hospital implemented a new electronic health record (EHR). After the initial rollout, staff nurses noted that their new EHR was missing a broad unit report. Prior to the EHR, there had been no consistent format for charge nurse report hospital wide. Practices included paper notebooks, Apprentice (computerized application which gathered high level data from the electronic medical record), SharePoint sites, and Excel spreadsheets. The high level information required by a charge nurse should be conveyed in a clear, standardized, up to date, and efficient way as recommended by Joint Commission. This issue was identified as an opportunity for practice improvement by the BWH Nursing Informatics Committee.

Method

Informatics committee members were each asked to present their unit's process for charge report for analysis by the full committee. The oncology service had developed a "Charge Report" which pulled data from the EHR and allowed an additional field for free text input from users. The "Charge Report" could be accessed by all staff members on each of the individual units. As this method showed the most promise, the committee agreed on this platform for wider implementation. Committee members were asked to convey the "Charge Report" concept to the individual units and assess the level of acceptance.

The members were then tasked with identifying which data elements each unit was collecting in charge reports using the varied tools. Common elements were identified and analyzed, and a minimum set of data was agreed upon by the committee.

A subcommittee was tasked with development of a Tip Sheet that includes step by step instructions on how to build this list in the EHR. The steps included the specified required data elements and instructions on list ownership, maintenance, and security. The committee approved the Tip Sheet and its use in coaching the units in adapting to the "Charge Report."

Results

Brigham and Women's Hospital is currently in the process of implementing this tool. The Tip Sheet has been submitted for approval for the BWH policies and procedures website. It has been presented to department experts, nurse educators, and the nurse-in-charge forum. The Committee plans to evaluate implementation in the near future.

Discussion/Conclusion

To date, staff adoption of this technique for performing charge shift report has been well received. Staff continues to express a desire to print the report. We are in the process of creating guidance to address HIPAA concerns. Limitations of the system have presented some challenges for customization to individual unit needs: patients in off floor location, and additional fields. While system optimization should allow for greater flexibility for the units to be able to customize the EHR for their unit needs, we have focused on ensuring that the core process is in line with the Joint Commission's National Patient Safety Goals.

Creating Documentation "Best Practices" Following a Large Scale EHR Implementation

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Introduction/Background

Electronic health record (EHR) use has increased dramatically in recent years after the passing of the Health Information Technology for Economic and Clinical Health Act (HITECH) which provided financial incentives to health care organizations to support the adoption of an EHR. Patient safety concerns have been of paramount importance in institutions where EHRs are in use. Nurses, as end users of such a product, are in a unique position to identify workflow challenges and suggest improvements to enhance process standardization.[1] A recent EHR implementation resulted in the loss of inpatient documentation standardization across the nursing department. This abstract describes the effort to identify where standardization would be critical to insure patient safety and to implement a mitigation strategy.

Methods

Clinical Nurse Educators and Nursing Informatics Leadership, identified aspects of nursing care and documentation where streamlining and structure would promote consistency and standardization of documentation, compliance with institutional nursing policies and procedures, and improve nursing workflow. Smaller work groups reviewed applicable nursing policies, procedures, nursing work flow and the EHR to create "best practice" documentation guidelines (BPGs). Each BPG was vetted with all relevant multidisciplinary content experts before it was disseminated to Super Users during a monthly update meeting and to the entire nursing community via email. Nurse Educators took the lead to educate unit based staff on the guidelines. All BPGs are made available from within the online electronic Nursing Clinical Practice Manual.

Results

Initial efforts focused on high volume, high priority, high risk areas of nursing documentation. Intake & Output documentation fell into this category and became the focus of our first BPG. Within the EHR there were many different "places" on the flow sheet where I&O data could be entered and it became clear that this could cause miscommunication or misunderstanding of the patient's overall fluid balance as well as balance from specific output locations and implements. Once completed, the team prioritized additional areas in need of standardization within the EHR (Table 1).

Table 1: Documentation Best Practice Guidelines

• Intake and Output	• Nursing Notes
• Nasogastric Tubes and Tube Feedings	• Pressure Ulcer Staging
• Drains, Ostomies, Urine, Stool	• Nurse Driven Protocol for IUC removal
• Code & Rapid Response Documentation	• Critical lab Results
• Pain Assessment	• Continuous Renal Replacement Therapy

Discussion/Conclusion

Best Practice nursing documentation guidelines were developed to promote consistency and standardization of nursing documentation in an EHR They are designed to ensure that nursing documentation is accurate, complete, timely, organized and compliant with accepted standards. BPGs are designed to reflect nursing knowledge, judgment and skills. They can serve as a source of data for nursing research, to assess nursing interventions, evaluate outcomes, and determine the efficiency and effectiveness of care. They can reduce inaccuracies in documentation. They are designed to strengthen collaboration between members of the interdisciplinary team. Best Practice documentation guidelines facilitate hand off between nurses because, when followed accurately, the EHR will provide accurate and complete information for the seamless delivery of safe, competent and ethical care.

Implementation of a Nurse Driven Protocol for Heparin Titration

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Introduction

Achieving anticoagulation early after a thrombo-embolic event is critical to optimize patient outcomes. Studies demonstrate body weight to be the best predictor of individual heparin requirements and also that use of nurse-driven weight-based heparin nomograms can decrease "time to therapeutic anticoagulation" (TAC) without an increase in risk of complications.[1,2] At this Academic Medical Center, an enterprise-wide electronic health record (EHR) was implemented in May 2015. Prior to this implementation, heparin infusions were ordered as units per hour and orders were written by licensed independent providers (LIP) for all heparin titrations. With implementation of a new EHR, nurse-driven weight-based heparin nomograms were implemented for select IV heparin infusions. To insure a safe transition to this new practice, systematic educational and process measures were taken to prepare all clinical staff for this change in practice.

Methods

An enterprise wide interdisciplinary team including LIPs, pharmacists, expert nurses and informatics nurses was convened to create and implement a plan for practice change. Interventions included:

- Nursing Informatics (NI) team worked with EHR builders to insure intuitive user interface for nurses
- NI experts, in partnership with EHR training team, created heparin nomogram online learning module which was mandatory for all clinical nursing staff
- NI and clinical team updated Smart Infusion Pump Drug libraries to support new ordering change
- Developed unit-based expert resources through education of nursing super users and clinical nurse educators
- Communication with LIP and pharmacy colleagues
- NI experts developed and implemented "go live" conversion checklist, to be completed by a nurse/pharmacist team caring for any patient who had active heparin infusion at "go-live"
- Daily electronic reports of patients on heparin were sent to clinical educators to review with nursing staff.
- Interdisciplinary team met regularly to review new issues, identify opportunities for real time education, and monitor compliance with nomogram use.

Results

Despite all preliminary preparation efforts nurses found this transition challenging. For one month post go-live, NI team members made daily rounds with nurses to support the new practice. Data from 317 pre-nomogram patients and 95 post EHR nomogram patients were collected and compared:

- Overall nomogram compliance was 84.6%
- TAC was significantly reduced in nomogram patients when compared with pre-nomogram patients ($p<0.005$).
- A significant increase in patients who achieved TAC at 24 hours was observed with nomogram vs. pre-nomogram use ($p=0.002$).
- No significant difference was seen in patients with a PTT $\geq$120 seconds while receiving heparin ($p= 0.73$).

Discussion / Conclusion

Introduction of nurse-driven weight-based heparin nomograms with implementation of a new EHR was a significant practice change for all clinicians and a potential patient safety risk if not implemented thoughtfully. Identification of a dedicated interdisciplinary team with knowledge of targeted interventions proved to be an effective method to insure mitigation of patient risk. Nursing staff were most affected by this change and required dedicated at the elbow support to apply the nomogram successfully. The team continues to monitor use and compliance with nomograms and identify opportunities for continued improvement.

Mapping the Gaps: A Geographical Analysis of Evidence-Based Community Exercise Programs for Older Adults in the Boston Area

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Introduction/ Background

Falls are a leading cause of death related to injury among people 65 or older[1]. Many adults in this age group fear falling, fall related injuries and know someone who has fallen. People become less confident as they age due to sensory changes, decreased muscle strength, bone density and reflexes[1]. An initial fall is the highest predictor of a person's risk for a subsequent fall. As the American patient population ages falls and fall related injury prevention are essential to lowering healthcare costs, maintaining patient independence, and decreasing hospitalizations[2]. There are many evidence-based falls prevention exercise programs that successfully reduce falls in older adults but are difficult to locate and therefore not routinely used in practice. According to Burtman, Aeronautical Reconnaissance Coverage Geographic Information Systems (GIS) mapping technology allows for institutions to identify where program/resource gaps exist in underserved communities giving insight into where improvements could be made[3,4]. This study aims to use GIS software to map the evidence-based exercise programs to the accessibility of the exercise intervention within the Boston area. The project specifically focuses on Tai Chi: Moving for Better Balance and Matter of Balance community-based exercise programs.

Methods

GIS is software that uses spatial analysis and census level data to examine location, attributes and relationships of geographical features within a specific area[4]. Researchers at Brigham and Women's Hospital used GIS to determine patterns of access for evidence-based community exercise programs, specifically Tai Chi: Moving for Better Balance and Matter of Balance throughout the Boston Area. These findings are depicted through maps that highlight areas where there are gaps and barriers in accessibility to community-based exercise programs.

Results

Results are pending.

Discussion/ Conclusion

Identifying geographical locations of these programs and where there are gaps may help to increase community-based exercise program accessibility. In addition, it will allow for institutions to further understand community needs as an effort to keep older adults active and independent.

Using Clinical Decision Support in an EHR to Facilitate a Nurse-Driven Protocol

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Introduction/Background

It is well known that the use of indwelling urinary catheters (IUC) during an acute hospitalization increases the risk of catheter-associated urinary tract infection (CAUTI). Reducing the length of catheterization (catheter-days) can reduce CAUTI risk.[1,2] Prior to the implementation of an integrated electronic health record (EHR) at this Academic Medical Center (AMC), a Nurse Driven Protocol (NDP) for IUC removal had been implemented utilizing a hybrid approach with electronic decision support for the ordering of the protocol and a paper flow sheet for documentation. This protocol effectively reduced catheter days by 11% at this AMC in early 2015. Implementation of a new EHR created new workflows for ordering and documentation and some software "bugs" that led to a decrease in the ordering and documentation of IUCs and the use of the NDP. The work described here was initiated to recoup or surpass previously obtained outcomes.

Methods:

To address the issues resulting from the implementation of our EHR, interprofessional collaboration was employed to identify specific problems and possible electronic solutions. Issues that were addressed included redundant order sets, suppressed CDS Best Practice Alerts (BPAs), nursing work list prompts and related flow sheet documentation. Upon completion and before activation of software modifications, reference sheets and education were provided.

Results

Order sets were simplified and standardized across phases of care. They were modified to provide clarifying language related to IUC care orders in the Emergency Department order sets and required entry of a specific date and time for the removal of IUC in post-op order sets. The CDS BPA was modified to trigger the morning after an IUC order is placed. This BPA requires the ordering provider to choose either to discontinue the catheter 'now' or to order the NDP for removal of IUC. Improvements to the Flowsheet and Work List include:

- When NDP is ordered, a 'reason for continuation' row automatically populates the Flowsheet.
- A Work List task prompts the nurse (every 8 hours) to utilize the NDP for assessment of NDP exclusion criteria
    - Presence of exclusion criteria requires ongoing use of the IUC
    - Absence of exclusion criteria initiates the NDP and removal of the IUC
- Documentation of this assessment from the Flowsheet or the Work List now satisfies the NDP requirements
- A link to the NDP for IUC Removal Policy and algorithm (utilized for decision support and next steps after catheter removal) was built into the EHR.

The EHR and workflow modifications contributed to a sustained 14% decrease in catheter-days, surpassing previous performance of the NDP.

Discussion/Conclusion

The implications of a new electronic health system can greatly impact work flow and potentially jeopardize existing quality improvement projects. The goal of these EHR modifications was to facilitate care providers in the ordering, assessment and documentation for appropriate urinary catheter usage and utilizing a NDP for Urinary Catheter Removal. These improvements were accomplished through interprofessional collaboration and a shared vision to achieve or surpass previous performance.

Using Patient-Centered Technological Design in an Electronic Toolkit for Inpatient Fall Prevention

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Introduction/Background

Falls are a serious patient safety issue. In 2009 we demonstrated a 22% reduction in fall rate by using HIT to link routine fall risk assessment with evidence-based interventions and research showed that patients and family also needed to be more engaged in fall prevention planning.[1] Therefore in our current study we conducted usability testing on our web and mobile applications which allow patients and family to complete the fall risk assessment with the nurse at the bedside. This abstract describes the process of achieving patient-centered design of the technological applications to improve patient safety in the hospital.

Methods

We used a participatory design to engage nurses, patients, patient and family advisors to provide feedback on an initial design through informal interviews. Programmers developed the applications based on the refined mock up. As soon as functional prototypes for both applications were available, BWH researchers conducted usability testing with patients and nurses, which included task scenarios, a quantitative usability survey, and a qualitative survey. Their feedback helped iteratively refine the applications.

Results

Usability testing is ongoing but testing and products will be finalized by April 2016. A summary of results is provided in Table 1. A 5-point Likert scale is used for the usability survey, where 1 equals "strongly disagree" and 5 equals "strongly agree" with the statement.

Table 1. Usability Testing Feedback

	Mobile Application (n=4)	Web Application (n=5)
Task scenarios	All three given "above average easy" ratings to complete	One of five scenarios received "average" for easiness
Major Comments	"Simple to use", "arrow for next wasn't obvious"	"How to move forward to next risk isn't clear", "edit plan' button's purpose isn't clear."
Usability survey	Score of 4.25 for "I would like to use this system frequently"	Score of 3 for "I thought the system was easy to use"

Discussion/Conclusion

Our first round of testing provided valuable qualitative and quantitative feedback for continuous refinement of our applications. A 2015 study found that one third of EHR vendors failed to conduct a user-centered design process as required by law, and 63% of vendors engaged fewer than 15 participants in end user testing.[3] Another study found that usability testing is critical to the success of clinical information systems when the clinician is an end-user.[4] We theorize that the same is true when the end-user is a patient and believe that this study will offer insights into best practices.

Bringing Our Best Practice Forward

Integrating Preformatted Patient Discharge Instructions into EHR

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Introduction/Background

With more and more surgeries evolving into outpatient procedures, there is a greater need to provide comprehensive patient teaching and education. Literature has shown that insufficient patient education results in poor outcomes, avoidable complications such as pain, fatigue, and decreased self care. [1] In May 2015, Brigham and Women's Hospital and its distributed campus went live with a newly acquired electronic health record (EHR), Epic. The initiation of EHR challenged our nursing practice in the area of patient education, discharge instruction and handouts for our ambulatory surgery patients. Prior to EPIC our patients received preformatted discharge instruction handouts that included: Surgeon and surgery specific education/instruction, education/instruction on caring for any placed lines or drains, and all contact information with phone numbers of "Who to call and when to call". Epic contains very generic discharge instructions but does not have such pertinent information; we had to determine a way to integrate our current nursing practice and patient care into our new practice that included EPIC

Methods

Within Epic there is a feature called SmartPhrase. This feature allows the user to create a word document that can be saved and shared with other users, SmartPhrases can be used on multiple encounters. Because we had saved all of the surgeon/surgery-specific discharge instructions in a shared file prior to Epic, we were able to open these documents, then copy and paste them into a SmartPhrase within the Epic system. We customized the new SmartPhrases, gave them an appropriate title that included both physician name and contact information along with all specific discharge instructions. Once these were created, we could attach the SmartPhrase that included the appropriate discharge instructions to the patient instructions column in the After Visit Summary (AVS) of the patients chart. The AVS is printed prior to the patient being discharged and the patient is given a paper copy for reference. All surgeons, and a group of Super Users, were made owners of the SmartPhrases. Patient specific SmartPhrases were granted to all end users so that they can import these instructions to AVS and modify on the day of surgery.

Results

Patients are able to receive up-to-date surgeon/procedure specific discharge instructions and education handouts with all pertinent and appropriate documentation included. With the patient specific customization allowed in AVS, care providers are able to review and/or revise any instructions given to the patient at any point prior to and/ or after discharge.

Discussion/Conclusion

This method proved effective for patient education, safety and communication among all persons involved in patient care.

The Value of a Multi-Disciplinary Informatics Team in the Implementation of an Electronic Health Record

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Introduction and Background

Massachusetts General Hospital (MGH), a founding member of Partners Heath Care, is undergoing a large scale implementation of an integrated vendor based electronic health record (EHR). This project called Partners eCare, is the largest and most complex collaboration across Partners HealthCare to date. A year and a half prior to implementation, MGH formed a multi-disciplinary informatics team to help bridge the gap between clinicians and Partners eCare. "Applied clinical informatics work is highly interprofessional with patient safety implications that heighten the need for best practice models for governance structures, adequate resource allocation, and role-based competencies" (Collins et al., 2015)[1].

Methods

The Informatics Analyst team comprised of multidisciplinary clinicians (2 physical therapists, 1 respiratory therapist, 1 dietician and 20 nurses) was developed from within the organization. The 20 nurses were selected to represent the variety of departments at MGH - medicine, surgery, cardiac, oncology, neurology, pediatrics, OB, neonatal, behavioral health, perioperative, and ICU, and continued to provide direct care part- time on their home units. The informatics analysts were responsible for supporting the users through all phases of clinical implementation including workflow analysis, hardware walkthroughs, organizational readiness, training and go live support**.**

Results

The informatics analyst for each department became the expert in the clinical workflow and the liaison between Partners eCare and the clinicians. The informatics analysts have become vital to the understanding of the workflow, identifying a need for change based on EHR knowledge, and identifying barriers to patient safety and experience for each specialty and department. The ability to articulate and disseminate information to nursing leadership and peers has increased acceptance of eCare among their peers. A key component was the development of a strong working relationship between the analysts, leadership and end users of the departments and units they supported.

Discussion

The clinician in the role of informatics analyst has become an essential part of the implementation process at MGH**.** The Informatics Analysts serve as the liaison between nursing, informatics leadership, clinicians and Partners eCare**.** They understand the culture of the units and recognize the value of the system to the clinician. Collins et al found that the partnerships across the nursing structure, the medical structure and the information systems (IS) structures are integral to achieve successful outcomes[1]. They also found that informatics needs to be seen as a clinical project in collaboration with IS.[1]

Improving the Safety of Heparin Protocol Infusions: The Journey Continues

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Introduction/Background

Intravenous heparin therapy has been identified by The Joint Commission as a high-risk medication that can potentially lead to adverse drug events. Heparin weight-based protocols have been shown to improve the ability to maintain patients within an appropriate therapeutic range, but can present patient safety challenges due to the complexity of prescribing, administration and monitoring processes.[1]

Despite longstanding efforts to reduce risk of errors through use of computerized nurse driven protocols, errors continued to occur, often due to ordering of initial weight based infusion rates and bolus doses over the protocol-defined maximum. In early 2015, Epic was implemented, including heparin protocol order sets with design features targeted to reduce these known sources of error. Monitoring of our internal electronic error reporting system (eERS) data indicated that despite these new ordering screens, errors were still occurring in unacceptably high numbers.

Methods

A workgroup consisting of nurses, pharmacists, physicians and representatives from the Epic team was formed to evaluate the current process and identify additional safeguards to reduce the occurrence of errors. This aligns with Joint Commission recommended actions to improve safety of anticoagulant medications (NPSG.03.05.01), which requires organizations to evaluate anticoagulation safety practices, take action to improve practices, and measure the effectiveness of those actions in a time frame determined by the organization.

The major changes included:

- Application of dose limits within heparin protocol order panels that "cap" initial weight-based infusion rates that would result in exceeding protocol defined maximum infusion rates (12 units/kg/hr for low intensity and 18 units/kg/hr for high intensity protocol).
- Created a "Nursing Heparin Protocol Bolus/Anti Xa Panel" which provides dose limits/ "caps" for protocol-defined weight-based bolus doses.

Results

The initial heparin protocol infusion rate was audited for 60 patients who had a documented weight which would have resulted in exceeding the protocol max initial infusion rate. We found that of the 30 pre-change orders reviewed, 40% (12/30) were ordered with the correct initial dosing rate to comply with the protocol-defined maximum initial rate. For the 30 patients reviewed after system changes implemented, 90% (27/30) were ordered for the correct initial dosing rate.

Discussion/Conclusion

The multidisciplinary team approach produced important lessons for improving the quality of intravenous heparin use and resulted in increased reliability of ordering initial heparin infusion rates within protocol define limits.

Monitoring the performance of physician and nursing workflows related to heparin protocols will continue. Some recognized ongoing challenges include:

-Nursing staff not consistently using the order panel to place orders for heparin protocol bolus

-Physician staff who may be using a saved version of an older order set that does not have the updated safety features.