Trends in Clinical Informatics: Poster Presentation 20th Annual Symposium May 17, 2024

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Empowering Clinical Nurses to be the Next Generation of Nurse Informaticists: Boston Medical Center's Nursing Informatics Fellowship

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Keywords: Nursing Education and Training, Informatics Fellowship, Professional Development, Succession Planning

Introduction/Background
Nursing informatics is a broad field that is essential to nearly every facet of work in a healthcare system.[1] As part of recruitment and retention, a fellowship was proposed as a succession plan for the Nursing IT department. A systematic review of literature was performed and analyzed. A fellowship charter was developed and internally posted to members of the Nursing Informatics Council (NIC). The fellowship required a formal application process with eligibility requirements including: BSN, two plus years of employment at BMC, current or past member of NIC, excellent communication and technical skills, super users of EHR and related software, and a letter of recommendation from unit leadership. We utilized Patricia Benner's "From Novice to Expert" nursing theory and BMC's official Nursing Professional Practice Model as a foundation for the program, providing both didactic and hands on project experience.[2]

Methods
The fellowship consisted of a practicum, independent scholarship/project work, didactic, and software training. Fellows worked 12 hours weekly with 4 hours of time dedicated to independent work. Weekly meetings were held with formal agendas, in which fellows and mentors collaborated on projects and new initiatives and participated in interdepartmental meetings. Group project work was introduced and all fellows worked on individual projects. Fellows shadowed Nursing IT specialties throughout the hospital. Didactic methods included instruction on ancillary software tools, a 16 hour course on Fundamentals of Nursing Informatics, an ITS Project Management course, and training in individual EHR software modules to understand transitions of care.

Results
We anticipated two fellows for a six-month commitment, but high interest resulted in six fellows who completed an eight-month fellowship. Fellows were able to learn a new specialty of nursing and drive their own projects, bringing a sense of autonomy and productivity to the role. The largest group project was the creation of downtime documents. Fellows returned to their home units as change experts with new knowledge as well as the ability to take on leadership roles within nursing.

Discussion/Conclusion
Upon graduation from the fellowship, two fellows were hired into full time positions within the Nursing Informatics department, replacing one vacant position, and anticipating one future vacancy. Fellowship participation significantly decreased orientation needs for the nurse informaticist position. The fellowship garnered a lot of interest within the nursing department, and based on verbal feedback, prepared the fellows for a nursing IT position. Nursing leadership has expressed interest in supporting a second fellowship.

References
1. American Nurses Association. Nursing informatics: scope and standards of practice. 3rd ed. Silver Spring (MD): ANA. 2022.
2. Benner P. From novice to expert. AJN. 1982;82(3):402–7.

Translating Evidence on Exercise for Lower Limb Osteoporotic Fracture Prevention into Clinical Decision Support Tools

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Keywords: Clinical Decision Support System, Nursing Informatics, Secondary Prevention, Exercise

Introduction

Osteoporosis affects 17.7% of Americans aged over 65, leading to 2 million fractures a year, increased disability, mortality, and the risk of subsequent fractures by 86%[1]. Despite its importance in preventing secondary fractures, there's a significant gap in patients consistently performing the right exercises[2]. This review aims to gather evidence for a Clinical Decision Support System (CDSS), which will offer healthcare professionals and patients guidance on effective exercises to prevent secondary fractures in those 65 and older with previous lower extremity fractures.

Methods

The scoping review exclusively included randomized controlled trials (RCTs) to ensure high-quality evidence for the CDSS. The search strategy, crafted with an expert librarian, combined keywords related to Age, Fracture, Exercise, Secondary prevention, and RCT using Boolean connectors (AND, OR). A systematic search with this query was conducted across OVID, Medline, Embase, and CINAHL databases from January to February 2024. The findings were organized according to the National Institute on Aging's exercise categories[3]: **Endurance** (e.g., brisk walking, jogging, dancing), **Strength** (e.g., lifting weights, using resistance bands), **Flexibility** (e.g., back stretch, ankle stretch), and **Balance** (e.g., Tai Chi, standing on one foot, balance walk). Furthermore, the results were classified based on the setting of exercise implementation (**Healthcare facility** / **Home-Based** exercises).

Results

The search generated 3,941 articles, from which 1,799 duplicates were removed. The initial review excluded 2,053 articles from titles and abstracts, and 69 more were removed after full-text review for reasons like age under 65, upper limb fractures, multi-component exercises, non-RCTs, or unrelated main interventions. Finally, 20 articles were included in the scoping review. Of these, four focused on endurance exercises, six on strength, one on flexibility, and one on balance. Additionally, four articles examined a combination of strength and balance exercises, three on strength and endurance, and one on endurance, strength, and flexibility. Home-based exercises were the focus of five articles, while 15 detailed exercises in healthcare facilities. Across all included studies, exercises demonstrated statistically significant improvements in primary or secondary outcomes.

Discussion and Conclusion

We will use evidence from research to craft recommendations for healthcare providers and patients in CDSS, tailoring the exercises to specific fracture types, mobility levels, cognitive status, and other health conditions. Evidence regarding home-based exercises will be used for referrals to community programs and self-care. Additionally, we will integrate evidence of exercise benefits into CDSS talking points, supporting clinicians in highlighting these advantages with patients. The review's findings will guide the selection of exercises for patient education materials, which will be illustrated on exercise handouts and supplemented with links to web-based video demonstrations. Additionally, this evidence will enhance a patient application, providing exercise videos, and enabling activity and goal tracking within each exercise category. Finally, based on the evidence gathered from this review, we will create patient education materials that highlight the benefits of exercise, tailoring the content to reflect the demonstrated advantages.

References

1. Kanis JA, Johnell O, De Laet C, Johansson H, Odén A, Delmas P, et al. A meta-analysis of previous fracture and subsequent fracture risk. Bone. 2004;35(2):375-82.
2. Hoffmann I, Kohl M, von Stengel S, Jakob F, Kerschan-Schindl K, Lange U, et al., Exercise and the prevention of major osteoporotic fractures in adults: a systematic review and meta-analysis with special emphasis on intensity progression and study duration. Osteoporos Int. 2023;34(1):15-28.
3. National Institute on Aging. Four types of exercise can improve your health and physical ability [Internet]. 2024 March 22. Available from: https://www.nia.nih.gov/health/exercise-and-physical-activity/four-types-exercise-can-improve-your-health-and-physical

Identification and Quantification of Patterns of Multiple Pressure Injury on Same Body Location Using Real World Clinical Records and a Data Science Approach

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Keywords: Pressure injury, Electronic health records, Nursing informatics, Data science

Introduction/Background

Pressure Injuries (PrIs) are defined as "localized lesions of the skin or underlying tissue caused by pressure", classified into stages 1-4, deep tissue injury (DTI), and unstageable[1]. There is lack of research on patients with multiple PrIs at the same body location and related characteristics.

Methods

We identified patients with PrIs from the EHR database of five hospitals affiliated with Mass General Brigham (MGB) Healthcare System. PrIs and associated data were extracted through the nursing documentation flowsheets. We then identified patients who had multiple PrIs at the same body location on the same date (Multi-Injury Group) and those with only a single PrI at these locations (Single-Injury Group). Two clinical experts reviewed charts of 50 patients to confirm categorization, achieving excellent agreement (Cohen's Kappa = 1.00). We compared demographic and PrI-related information using t-tests, Mann-Whitney U tests, and chi-square analysis in R (version 3.6.3).

Results

For the period between 2015 and 2019, we identified 16,800 patients with PrIs across five MGB hospitals who had at least one recorded PrI. The mean age of these patients was 70.08, and 55.93% were male. Among the patients, 1,224 (7.29%) had at least two distinct PrIs on same location. Early-stage PrIs (stage 1 and 2) were common in Buttocks and Coccyx, while severe PrIs (stage 3 and 4, DTI, unstageable) were more prevalent in Heel and Sacrum locations. The Multi-Injury Group had higher rates of severe PrIs across locations. Age differences were significant only for PrIs in the Coccyx location. Length of stay varied between groups but was statistically significant among those with PrI's in the Sacrum. Gender distribution was not significant, but race distribution was significant in Coccyx and Buttocks areas.

Discussion/Conclusion

The study suggests that multiple PrIs at the same location may worsen PrI prognosis and that severe PrIs could trigger secondary injuries at the same location. Furthermore, there may be disparities regarding the occurrence of multiple injuries at the same location, with Black or African-Americans potentially at higher risk, highlighting possible health inequalities.

References

1. Edsberg, LE, Black, JM, Goldberg M, et al. Revised national pressure ulcer advisory panel pressure injury staging system: revised pressure injury staging system. J Wound Ostomy Continence Nurs. 2016;43(6):585-97.

Developing a Healthcare Process Model to Understand Electronic Health Records-based Pressure Injury Data

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Keywords: Electronic Health Records, Pressure Injury

Introduction/Background

The complexity associated with Pressure Injury (PrI) healthcare processes and incompleteness of patient records in the Electronic Health Record (EHR) present significant challenges to building high fidelity phenotypes for PrI model training[1]. This study aims to build a PrI Healthcare Process Model (HPM) that reflects the interplay of clinical care, data science methods, and informatics techniques to better understand the EHR-based PrI data.

Methods

The PrI HPM was developed using mixed methods that integrated qualitative and quantitative findings through interdisciplinary collaboration. In the qualitative study, five focus group sessions were conducted with interdisciplinary experts to identify the dynamics between nurses' work and the data recording process. Subsequently, an expert-defined keyword extraction algorithm was applied for PrI cohort extraction of the quantitative analysis. The data underwent validation by comparing it with a cohort pulled using the ICD-10 code ('L89') and manual chart review.

Results

Table 1. Key Themes Extracted from Qualitative Analysis

Main subject	Themes
Nurse PrI Care Workflow	Clinical nurse PrI care process; Wounds expert nurses PrI care process; Clinical Decision Support with PrI care
EHR Documentation Flow	Data type; data format; Data entry/storage location
Potential challenges of PrI EHR data	Challenges from inconsistency of EHR data

In the qualitative analysis, we identified seven themes corresponding to three main subjects (Table 1). In the quantitative analysis, we compared patients from the two PrI data groups (keyword cohort: 26,223 patients, ICD cohort: 12,057 patients), a total of 3,072 patients included exclusively in the ICD cohort were not in the keyword cohort. Through discussions with the domain experts, we identified potential factors leading to overlap and inconsistency between the two phenotyping methods. The PrI HPM was developed by integrating the results of the two analyses and incorporating three moderating factors that affect PrI records: 'system configuration', 'hospital policy', and 'individual nurse's workflow'. Further detail will be provided in the poster.

Discussion/Conclusion

The HPM can enhance PrI phenotyping fidelity by incorporating nurses' PrI clinical care and EHR documentation workflows, along with the three moderating factors. Furthermore, incorporating HPM into the development of a data-driven PrI pipeline would improve PrI data quality.

References

1. Hripcsak G, Albers DJ. Next-generation phenotyping of EHRs. JAMIA. 2013;20(1):117-21.

Multi-state Modeling of Pressure Injury Staging Transition Trajectories

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Keywords: Pressure injury, Machine learning, Time series analysis, Artificial intelligence, Nursing.

Introduction/Background

Hospital acquired pressure injuries (PrI) are common, painful, and expensive adverse events associated with negative patient outcomes and a mortality rate of 11.6%.[1,2] The National Pressure Injury Advisory Panel's (NPIAP) staging system includes six stages ranging from non-blanchable erythema and intact skin (stage 1) to full thickness wounds (stage 4), suspected deep tissue injury (sDTI), unstageable and mucosal.[3] Clinically, patients can progress from mild injury (e.g. stage 1 or 2) to more severe injury states (e.g. stage 4) over time. The dynamic transition pattern of injury stages (i.e. stage transition trajectory) can provide important information for injury evaluation and corresponding intervention strategies. Today there is a dearth of research exploring the underlying mechanism of stage transitions. In this study, we utilized Markov multi-state modeling[4] to evaluate the time-sensitive progression trajectory of pressure injury stages based on real-world electronic health record (EHR) datasets.

Methods

We extracted PrI records including stage measure values and the time of injury occurrence from nursing documentation flowsheets from across 5 hospitals (2015 to 2023). We used a continuous-time multi-state model to estimate transition intensities between 3 pressure injury states: stage 1, 2 and severe stage (including stage 3, 4 or unstageable). For model input, we defined multiple rules for data cleaning steps and stage transitions based on NPIAP guidelines and expert opinion. Data pre-processing and model development was conducted using R (version 3.6.3).

Results

After data cleaning steps, we obtained 1,342, 1,085, 612 and 435 patients for locations of coccyx, buttock, sacrum and heel groups, respectively. Within each PrI location group, we further divided patients into 3 staging groups, including stage 1, 2, and severe stage (including stage 3, 4 and unstageable pressure injury). See Table 1.

Table 1. Estimated transition intensities between states

	Coccyx		Buttock		Sacrum		Heel	
	Transition Intensity (%)	95% CI	Transition Intensity (%)	95% CI	Transition Intensity (%)	95% CI	Transition Intensity (%)	95% CI
Stage 1 to Stage 2	0.013	(0.011, 0.015)	0.010	(0.009, 0.012)	0.007	(0.005, 0.009)	0.008	(0.006, 0.010)
Stage 1 to Stage 3/4/unstageable pressure	0.004	(0.003, 0.005)	0.003	(0.002, 0.004)	0.004	(0.003, 0.007)	0.002	(0.001, 0.004)
Stage 2 to Stage 3/4/unstageable pressure	0.019	(0.016, 0.022)	0.016	(0.013, 0.019)	0.025	(0.018, 0.035)	0.024	(0.016, 0.036)

Discussion/Conclusion

We developed a novel multi-state pressure injury trajectory model using real-world clinical records. An interesting pattern identified is that stage 2 seems to serve as a "gateway state" during the development trajectory to a severe stage pressure injury. Once a patient progresses to stage 2, the likelihood of transiting to severe stages is higher. We also observed location-dependent variations, suggesting location-specific intervention treatment can be important for pressure injure management.

References

1. Padula WV, Gibbons RD, Pronovost PJ, et al. Using clinical data to predict high-cost performance coding issues associated with pressure ulcers: a multilevel cohort model. J Am Med Inform Assoc. 2017;24(e1):e95-e102.
2. Edsberg LE, Black JM, Goldberg M, et, al. Revised National Pressure Ulcer Advisory Panel Pressure Injury Staging System: Revised Pressure Injury Staging System. J Wound Ostomy Continence Nurs. 2016;43(6):585-97.
3. Cheung LC, Albert PS, Das S, Cook RJ. Multistate models for the natural history of cancer progression. Br J Cancer. 2022;127(7):1279-88.

Ambulatory Vaccine/Medication Safety Project

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Keywords: Bar Code Medication Administration (BCMA), Clinical Documentation, Patient Safety

Introduction/Background

In 2021, in the Brigham and Women's Hospital (BWH) Ambulatory Primary Care and Specialty Clinics, 128 medication or vaccine incident reports were filed. These safety reports were related to prescription ordering, medication and vaccine ordering and administrations, as well as patients receiving expired medications. In evaluating these occurrences, variations among practices in how medications and vaccines were stored, administered, and documented were identified. These same factors were reported in an ISMP feature article.[1] While BCMA has existed for over two decades, hospitals struggle to adapt and implement it within their existing infrastructure.[2] Barcode medication scanners were available in the BWH practices since 2020, however the private practices did not have scanners. Beliefs were that this variation was leading to some of these errors.

Methods

A taskforce, including a nurse informaticist, nurse educator, pharmacists and a project manager was formed. Progress and outcomes were reported directly to the BWH Patient Quality and Safety Committee. It was decided to focus on the top two most impactful opportunities for improvement, wrong or expired medications being administered. The Ambulatory Nurse Council Committee and Nursing Leadership were identified as stakeholders. Workflow analysis identified a variation across the clinics in medication and vaccine administration and storage. The following interventions were implemented; routine expiration date checks/attestations, reeducation of staff on the 6 rights of medication administration and data tracking/sharing. Funding to implement scanners in all BWH/BWP clinics was secured. Measures of success were identified as:

- A 50% decrease in the number of wrong medications and vaccines administered to patients within six months.
- A 50% decrease in the number of expired medications and vaccines administered to patients within six months.
- Greater than 95% adherence to barcode scanning protocol, in applicable practices.

Results

Our goals of a 50% reduction of expired or wrong medications and vaccines being administered to a patient within 6 months was not met. However, we met the goal of expired medications or vaccines not being administered to a patient within 12 months post-intervention. We did not reach our goal of all clinics adhering to scanning medications and vaccines at greater than 95%. Additional details will be included in the poster.

Discussion/Conclusion

Implementing barcode scanners across the clinics and a system to track medications in the clinics standardized how medications and vaccines were stored, administered, and documented. However, medication administration documentation remains an area of opportunity for the clinics. In the ambulatory setting, medications have historically been documented retrospectively. Changing this culture will be dependent upon self-regulation of nursing practice to document prior to the medication or vaccine being administer and the prioritization, reinforcement, and accountability of ambulatory leadership and nurse directors/managers.

References

1. Learning from Influenza Vaccine Errors to Prepare for COVID-19 Vaccination Campaigns | Institute For Safe Medication Practices [Internet]. www.ismp.org. 2020. Available from: https://www.ismp.org/resources/learning-influenza-vaccine-errors-prepare-covid-19-vaccination-campaigns
2. Mulac A, Marhiesen L, Taxis K, et al. Barcode medication administration technology use in hospital practice: a mixed-methods observational study of policy deviations. BMJ Qual Saf, 2021 Dec; 30(12): 1021–1030.

The Optimized Use of a Contact-Free Continuous Monitoring System on Clinical Outcomes during COVID-19

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Keywords: Contact-free monitoring, CFCM

Introduction/Background

Monitoring in medical-surgical units consists of vital sign measurement every four hours based on patient status.[1] Patient decline can occur between collection of vital signs. Continuously monitoring heart and respiratory rates in the unobserved period can assist with detecting early deterioration. No studies have shown the impact of a contact-free continuous monitoring (CFCM) system integrated into a bed on clinical outcomes during the COVID-19 public health emergency. This study aimed to evaluate the impact of contact-free continuous monitoring on outcomes, including unplanned transfer to the ICU (primary outcome), ICU length of stay, hospital length of stay, rapid response, code blue, and mortality.

Methods

The study included all adult patients hospitalized for >24 hours in all medical and surgical units in a community teaching hospital and excluded hospice patients. The pre-implementation period (September 1, 2021 - May 31, 2022) and post-implementation period (September 1, 2022 - May 31, 2023) lasted 9 months with a wash-in period of 3 months (June 1, 2022- August 31, 2023). An interrupted time series (ITS) evaluation of the CFCM system was conducted over 21 months. The study was powered for the primary outcome of unplanned ICU transfers per 1,000 patients admitted. We used segmented logistic regression models (for the probability of unplanned transfer) to test for statistical significance of observed changes in the unplanned ICU transfer rates in intervention (post) versus control (pre) groups.

Results

Our primary finding was that unplanned transfer into ICU rates were not significantly reduced in the post-implementation period (1.4% vs 1.2% p=0.39).

Table 1. Study Outcomes Pre- and Post-implementation of Contact-free Continuous Monitoring Bed

	PRE (N=4696)	PRE: 95% Cl	POST (N=4694)	POST: 95% Cl	P Value
Unplanned ICU transfer (%)	1.40	(0.16-7.82)	1.20	(0.19-8.85)	0.39
Secondary Outcomes					
Code blue (%)	0.20	(0.10-0.39)	0.50	(0.32-0.77)	0.02
In-hospital death (%)	0.70	(0.37-1.35)	0.94	(0.50-1.76)	0.24
Mean hospital length of stay (days)	5.62	(4.28-7.40)	5.87	(4.46-7.71)	0.01
Mean hospital LOS for patients with unplanned ICU admission (days)	12.50	(8.81-17.8)	13.40	(9.47-18.90)	0.77
RRT calls (%)	4.21	(2.75-6.40)	5.03	(3.31-7.59)	0.066

Discussion/Conclusion

The data in the study needs to reflect the complexity of care impacted by the Covid-19 pandemic, such as length of stay and transfer rate. The intervention was positively received by staff, for example, response time to bed alerts. The effects of the pandemic confounded all variables.

References

1. Weller RS, Foard KL, Harwood TN. Evaluation of a wireless, portable, wearable multi-parameter vital signs monitor in hospitalized neurological and neurosurgical patients. J Clin Monit Comput., 2018 Oct; 32(5):945-951. doi:10.1007/s10877-017-0085-0

Device Integration of Portable Vital Sign Machines to the Electronic Health Record (EHR)

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Keywords: Electronic Health Record, Vital Sign Monitoring, Integration, Interface, Clinical Documentation, Reducing Burden of Documentation, Standardization

Introduction/Background

Evidence shows that automating the documentation of vital signs will improve the timeliness and completeness of the vital sign data in the EHR and decrease staff frustration with such documentation.[1] Brigham and Women's Hospital, an academic medical center in Boston, used a variety of devices and workflows to obtain vital signs with their Ambulatory Primary Care and Specialty Clinics. In addition, all vital signs were manually entered in the electronic medical record. These factors contributed to variations in the documentation of vital signs in the clinics. In 2023, a decision was made to standardize all vital signs machines to one model and integrate the device data to the EHR.

Methods

A taskforce of bioengineers, Clinical Business Analysts (CBAs) and Nurse Informaticists (NIs) was formed to assess the workflow, to make decisions to support the project, to develop training materials and formulate a go-live plan. Implementation was based on volume of vital signs taken in each clinic as well as location of clinic. The taskforce members met with stakeholders to obtain buy in. NIs shadowed nurses and medical assistants to document current workflow. A review of data output from the machines, which would be interfaced as feedback to the flowsheets was done and a gap analysis was performed. Bioengineering evaluated wireless connectivity and performed testing with devices. Testing was completed to ensure values interfaced as anticipated. Training resources were developed. The implementation started in June of 2023. Training was done by the CBAs and NIs prior to each clinic's go live. At-the-elbow support was provided on day of go-live and spot checks for utilization of integration was done two weeks after go-live. A dashboard was created to monitor utilization retrospectively.

Results

As a result of the integration, workflows to collect vital signs in the Ambulatory Primary Care and Specialty Clinics were standardized. Patients had a predictable experience at each of the clinics. The integration of vital signs monitors improved the timeliness of data capture and effectively eliminated transcription errors. Additionally, a Tableau dashboard was developed to monitor the utilization of device integration across clinics. As the implementation continued, the number of staff leveraging the spot vital sign integration and the number of patients whose vital signs were captured using the technology has increased month to month. The poster will provide more details of the utilization of the spot vital sign integration.

Discussion/Conclusion

The implementation of the spot vital sign integration will continue to expand to other clinics over time. Support for the project from the leadership within each clinic was important to the success of the implementation. Training for the spot vital sign integration has been incorporated into the orientation process for new hires. In the future, additonal functionality, including improving the log-in workflow to the device for staff with either scanning or badge tapping will hopefully continue to improve efficiency and statisfaction.

References

1. Skyttberg, N, Chen, R, Koch, S. Man vs machine in emergency medicine - a study on the effects of manual and automatic vital sign documentation on data quality and perceived workload, using observational paired sample data and questionnaires. BMC Emerg Med, 2018 Dec; 18(1), 54.

Improving Patient Safety and Emergency Department Staff Efficiency in Barcode Medication Administration by Using Mobile Scanners

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Keywords: mobile devices, barcode medication administration, scanner, workstations on wheels, staff efficiency, patient safety

Introduction/Background
Patient and medication scanning has been a continuing issue at our institution. The existing barcoding process uses the Emergency Department's in-room scanners and workstations on wheels (WOWs). In reviewing the Barcode Medication Administration (BCMA) weekly audit report, the reasons most frequently given for non-compliance were scanners broken or unavailable. Additionally, WOWs can be hard to find or move around in areas without built-in scanners. Adding mobile phone devices equipped with a scanning application addresses the abovementioned problems. The global aim is to improve patient safety and ED staff efficiency.

Methods
All shift nurse supervisors were trained in using the mobile phone device with scanning application, and they were tasked to train their staff during their shifts. Regular rounding was done to reinforce education and answer any staff questions or concerns. A pre/post-intervention survey was sent out to staff to evaluate the barcoding process and determine the perceived usability of in-room scanners/WOWs vs the mobile phone device with the scanning app using Lewis's[1] modified Technology Acceptance Model (mTAM). Pre-intervention had 26 respondents, and post-intervention had 36 respondents. mTAM was used to measure staff agreement regarding the products' perceived usefulness (PU) and perceived ease of use (PEU). The specific aims include increasing staff's patient and medication scanning compliance to 95% and above, decreasing occurrences of scanning noncompliance due to scanners broken and unavailable, and improving staff's perception of usefulness and ease of use with the mobile phone device with the scanning application.

Results
There was a substantial increase in the staff's perceived usefulness and ease of use with the scanning app on mobile phone devices. In the first week of March, prior to implementation, medication scanning compliance was 82%, and patient scanning compliance was 83%. Patient scanning compliance peaked at 93-94%, while medication scanning stayed above 90% in most weeks with the addition of the scanning app on mobile phone devices. Before the intervention, the "scanner broken" reason for noncompliance was provided 66 times, while "scanner not available" was the reason provided 262 times. In September, after implementation, the "scanner broken" reason decreased to 31, and the "scanner not available" reason decreased to 78.

Discussion/Conclusion
The scanning app on mobile phone devices remarkably helped increase staff compliance with medication and patient scanning. There are many external variables to consider, but most notably, having a clear use case for any QI initiative is integral. Unit leadership should set expectations and hold staff accountable for noncompliance. This QI project was instrumental in increasing staff efficiency with patients and medication scanning. We intend to introduce additional features of the scanning app on mobile phone devices, including scanning lab specimens, secure chat, and Webex calling. We believe that the desired goal of 95% staff compliance can be achieved as more and more scanning app features are added, and staff becoming more adept in using and integrating the new technology into their daily care of patients.

References

1. Lewis, J.R. (2019). Comparison of four TAM item formats: Effect of response option labels and order. Journal of Usability Studies, 14(4), 224-236.

Strides in Medication Reconciliation Safety

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Keywords: Medication Reconciliation; Safety; Best Possible Med History

Introduction/Background

The Joint Commission (TJC) has included Medication Reconciliation (Med Rec) as a National Patient Safety Goal since 2005, with most recent rendition, 2024 NPSG.03.06.01, requiring that health care facilities record and pass along correct information about a patient's medicines. This includes finding out what medicines the patient is taking, comparing those medicines to new medicines given to the patient, giving the patient written information about the medicines they need to take and telling the patient it is important to bring their up-to-date list of medicines every time they visit a doctor. ISMP has also released its 2024-2025 Targeted Medication Safety Best Practices for Hospitals. One of those strategies focuses on preventing medication errors at transitions in the continuum of care with the intent to prevent errors by facilitating collection of the best possible, most complete medication list at the patient's entry to the care setting, ensuring the medication and doses are correct for that patient given their current state of health, and by having a provider reconcile the medication history list to prescribed therapy documenting modifications and resolving any discrepancies.

Despite implementing a Medication History Technician (MHT) role Lifespan wide in July 2020, Lifespan continues to identify medication reconciliation errors related to the PTA med list not being updated to reflect the best possible med history and not having all medications reconciled.

Methods

In June of 2023, a multidisciplinary team was formed to evaluate the current state of the home medication list and its impact on medication reconciliation to identify and implement opportunities for improvement both within the EHR and operational oversight.

Results

Several system optimizations were implemented including a Diabetes management Summary Report with BPAs to alert providers of historical insulin orders, implementation of an Admission Med Rec Status column, and a visual change so that all orders without a Med Rec decision are highlighted in yellow. In addition, operations held a series of meetings with chiefs of the various services to review the optimized workflows and share the compliance reporting tools created. A computer-based learning module demonstrating the admission medication reconciliation process was also assigned to all providers. We are beginning to see improvements in admission medication reconciliation compliance with particularly favorable results in internal medicine and hospitalist medicine services. For example, on one general medicine unit, the % compliance to Admission med rec within 24 hours has increased from 58% in Qtr. 2 2023 to 89% in Qtr.to date.

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Discussion/Conclusion

Lifespans continue to struggle with several aspects of the medication reconciliation workflow but we have seen improvements and with the additional operational focus, expect to see our compliance increase even further.

References

1. The Joint Commission. 2024 Hospital National Patient Safety Goals [Internet]. Available from: hap-npsg-simple-2024-v2.pdf (jointcommission.org) 2024 [cited 2024 Mar 8]
2. Institute for Safe Medication Practices. ISMP Announces Three Additions to 2024-2025 Targeted Medication Safety Best Practices for Hospitals [Internet]. Available from: ISMP Announces Three Additions to 2024-2025 Targeted Medication Safety Best Practices for Hospitals | Institute For Safe Medication Practices 2024 [cited 2024 Mar 10]

System Downtime Preparation and Review

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Keywords: patient safety, downtime preparation, staff education, training

Introduction/Background

As technology advances to support the complexity of Health Care the potential negative impacts of an IT system outage on patient safety also grow[1]. As staff retire and new generations of health care personnel join the workforce fewer staff are familiar with paper documentation processes. Research shows nursing units need to prepare for downtime through drills and training.[2] After a healthcare system with 3 acute care hospitals experienced short but intense unplanned downtimes, system management began to critically review downtime processes and preparation plans in addition to the organization's state of readiness. It was noted that the organization structure did not define a responsible party to oversee downtime preparation, education or training which left the downtime documentation forms outdated and unreviewed.

Methods

The hospital informatic nurses in combination with the information services clinical informaticists created a Downtime Review Team to do a line-by-line comparison between downtime documentation forms and the EMR. In addition, the team collaborated with clinical operations to identify gaps in the downtime forms available with the goal to add to the downtime form repository. Hospital informatics nurses developed a table of contents by care area to organize downtime form storage on the units. The IS training department developed training sessions to introduce downtime tools. Hospital nursing education departments developed downtime competency assessments for all nurses to complete. Informatic nurses also partnered with leadership in emergency preparedness to conduct downtime tabletop exercises throughout the hospital to identify process or knowledge gaps.

Results

The Downtime Review Team continues to edit and create new downtime forms. Since October of 2021, the group has updated and reviewed 24 orderset downtime forms, 20 consents, 5 MAR forms, and 25 flowsheets. The team created additional forms such as a Kardex and heparin tracking form, downtime note forms, care plan downtime patient education, and multiple procedural forms. Table-top exercises at one hospital revealed areas for improvement, including communication processes, resources and assets during a downtime, and staff role and responsibilities. Based on these themes the Emergency Preparedness Committee has started to review a downtime topic quarterly. Also, all nursing staff completed a Downtime Competency requiring RNs to locate downtime forms, use the BCA reporting tool on their downtime computer, and review the process of obtaining a medication order and documenting the administration of the medication during downtime.

Discussion/Conclusion

Like many emergency preparedness topics, an IS system downtime requires a constant state of readiness. However, prioritization of resources to maintain, train and create downtime tools and forms can be challenging. Night shift staff seem to be most comfortable with downtime because they can maintain competencies during planned downtimes for upgrades. Day and evening staff are less comfortable and require periodic review of resources, policies, and processes to use during downtime. Communication structures also need close review as staff are often surprised by how much manual communication and phone calls are needed to replicate the automatic notifications normally present in the EMR to ancillary departments.

References

1. Institute for Safe Medication Practices. ISMP guidelines for Emergency Preparedness: Be ready for unanticipated EHR downtime [Internet]. Available from: https://www.ismp.org/resources/emergency-preparedness-be-ready-unanticipated-electronic-health-record-ehr-downtime.
2. Griner TE, Johnson H, Girard A. Prepare for Downtime Now. Nurse Leader. 2021 Sep

Optimizing an EHR Unit Operations Dashboard to Improve Quality Care in an Adult ICU Setting

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Keywords: Clinical Documentation, Patient Safety and Quality Improvement, EHR, Nursing, Unit Operations Dashboard

Introduction/Background

Overseeing the quality of care is a key component of the nurse managers role.[1] Historically, nurse managers used a variety of methods to monitor quality and safety metrics, including shift report, feedback from staff, review of Electronic Health Record (EHR) and analyzing reports. These methods lacked standardization, were isolated, time consuming and potentially provide outdated information. Dashboards are a visual tool that can be used to display large amounts of data in a standard interactive format with real time updates.[2] The Applied Clinical Informatics team collaborated with two nurse managers and an Information Systems (IS) report builder to optimize a unit operations dashboard tailored to Intensive Care Unit (ICU) quality and safety metrics.

Methods

The team optimized a unit operations dashboard that captures, analyzes, and presents key interpretable metrics for current patients in the adult ICUs. It was developed as a comprehensive landing page, where users can find real time quality and safety data based on nursing documentation and provider orders, current and historical patient census and occupancy metrics, and frequently utilized links to other reports outside of the EHR. The team worked in an iterative progression with continued Plan-Do-Study-Act (PDSA) cycles. The data was reorganized to allow for more comprehensive and efficient analyzation, new metrics were added to existing reports, and new reports were developed as managers recognized the usefulness of this data. Nurse managers were educated on the functionality of the dashboard through huddles, job aids, and at the elbow support.

Results

After the initial rollout, we found the dashboard usage varied significantly by user. Utilization of the dashboard began to increase as more anecdotal reports of patient safety concerns identified by using the dashboard were shared among the critical care managers. Senior management also supported and encouraged the dashboard as a mechanism to monitor quality care. Basic data about the name and frequency of users who accessed the dashboard were reviewed and analyzed. We plan to share more details about dashboard utilization on the poster.

Discussion/Conclusion

We learned that the dashboard development requires engaged end users, nurse leaders and IS staff that are committed to multiple PDSA cycles over time. The development took longer than expected and continued updates are required as there are changes in EHR documentation and orders as well as patient care recommendations. The optimization process was delayed at times as some of our resources were focused on other more pressing needs. We also recognized that the data was beneficial to the nurse educator role, so we broadened our rollout to this group.

References

1. van de Baan FC, Lambregts S, Bergman E, “et al”. Involving health professionals in the development of quality and safety dashboards: qualitative study. J Med Internet Res. 2023 Jun 12;25:e42649. doi: 10.2196/42649. PubMed PMID: 37307058; PubMed Central PMCID: PMC10337379.
2. Davy A, Borycki E. Business intelligence dashboards for patient safety and quality: a narrative literature review. Stud Health Technol Inform. 2022 Jun 6;290:438-441. doi: 10.3233/SHTI220113. PubMed PMID: 35673052.