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Admission Medication Reconciliation Process to Improve Patient Outcomes

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ABSTRACT

ADMISSION MEDICATION RECONCILIATION PROCESS TO IMPROVE PATIENT OUTCOMES

Medication reconciliation is an important process in the acute care setting that has implications for patient safety and outcomes. The medication reconciliation process occurs at transitions in care and involves disciplines including; nurses, pharmacists, and physicians. The role of the nurse in the admission portion of the process includes collecting and entering home medication information into the electronic medical record. It is crucial for the medication information to be entered in an accurate, timely, and complete manner.

The addition of the electronic medical record has not solved documentation challenges related to medication reconciliation but has added more transparency of issues. This quality improvement project looked at the nurses knowledge level and knowledge retention of the admission medication process at three points in time related to an educational intervention. A survey was used to measure the nurse's knowledge retention at the third point in time and collect additional information including demographics.

This project provides insight on the nurses comfort levels with skills related to the admission medication reconciliation process. Nurses perceived barriers to the admission medication reconciliation process were also identified. The information gained from this quality improvement project provides the organization and administration with guidance to support nurse's role in the admission medication reconciliation process.

Vanessa Ann Irwin
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by

Vanessa Ann Irwin

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APPROVED

For the Department of Nursing:

We, the undersigned, certify that the Doctor of Nursing Practice project of the following student meets the required standards of scholarship, format, and style of the university and the student's graduate degree program for the awarding of the Doctor of Nursing Practice degree.

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ADMISSION MEDICATION RECONCILIATION

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CHAPTER 1: INTRODUCTION

Medication reconciliation is the process of reviewing and reconciling the patients current medications with what the patient is taking at transitions in care; admission, transfer, and discharge. The goal of the process is to prevent medication errors from drug interactions, dosing errors, duplications, or omissions. A thorough completion of the reconciliation process is instrumental in ensuring patients have the correct medications continued on admission, transfer and at discharge. In spite of advancing technology and the implementation of an electronic medical record (EMR) there are still many factors that affect the medication reconciliation process including the technology itself and issues from each discipline involved; nurses, physicians, and pharmacists.

Purpose

The scope of this quality improvement (QI) project is focused on the nurse's role in the medication reconciliation process on admission. It is the role of the registered nurse (RN) admitting the patient to collect and record a list of the medications that the patient was taking at home. The home medication list is entered in the EMR, and this step sets the stage for the medication reconciliation to be completed by the physician for admission and the subsequent transitions in care. Therefore the nurse's role is one piece of reducing medication errors caused by the admission medication reconciliation process. The process the nurse completes for entering the home medication list has not changed significantly from the time that new EMR system was implemented except for the addition of resources the nurse can use to help complete this process.

The list of home medications should be entered in an accurate, complete, and timely manner, any deviation from this may cause a medication error. The

timeliness is crucial because the physician will attempt to review and reconcile the medications listed in the EMR during their admission routine. If the list of medication is not complete there is the possibility of an omission if a drug is not listed at all or the physician may not be able to reconcile the medication if all of the information is not included in the entry. If the medication information is not accurate the physician may reconcile a medication with the wrong dose or frequency, again possibly leading to a medication error.

There are a number of factors both in and out of the nurse's control that can impact the entry of a home medication list. Some of the examples that are out of the nurses control include; no medication list or medication bottles brought in, a patient that does not know what medications they are taking, or there are no family available or with the patient that knows their medications. All of these examples can impact the timeliness, accuracy, and completeness of the list of home medications the nurse needs to enter. Examples of factors that are in the nurses control include; the thorough review of the list of medications noting changes, completing the entry in a timely manner, careful and accurate entry of the medications, notification to pharmacy that the list is complete, and communication with physicians as needed regarding the home medications.

An educational intervention for nurse's role in the admission home medication process was implemented at an acute care hospital. Prior to providing nurses with the educational intervention a pre-test was administered to determine nurse's baseline knowledge of the medication reconciliation process. Following the teaching a post-test was administered to determine if the nurse's knowledge increased.

This data was accessed retrospectively. After a period of 60-90 days data was collected a third time to measure the nurse's admission medication

reconciliation knowledge retention. In addition to the questions regarding medication reconciliation knowledge a section to identify barriers to the admission medication reconciliation process was included in the survey. Identification of these barriers will facilitate strategic planning to continue to improve the medication reconciliation process. The barriers identified by nurses may include knowledge gaps, system issues, or process issues. These can be assessed and prioritized for rapid cycle changes or areas that may require more work with longer time frames. An outcome goal of the quality improvement project once nurse's knowledge is increased will be to improve patient safety by decreasing medication errors related to the medication reconciliation process. Nurses need to understand the significance of medication reconciliation as it relates to patient safety and quality outcomes.

Assumptions

There are assumptions that are made in the portions of the process of this quality improvement DNP project. The first assumption is that the patient is presenting accurate information of their home medications and as an organization a good faith effort is made to obtain the information within 24hours. The nurse relies a great deal on the patient and/or family regarding knowing or bringing in the information in a timely manner.

The next assumption that impacts the way that we look at this process and how to approach and improve it is related to nurses. The assumption is that nurses perform the home medication information collection and entry process with intentions of entering accurate information. There is no intent on the nurse's part to enter the medication information incorrectly. The majority of entry errors by the nurses are attributed to knowledge gaps or deficit regarding the medication, the EMR, and the resources available.

The final assumption is related to the number of medication errors that are caused by errors in the admission medication reconciliation process. The data regarding the number of these errors is gathered through the hospital occurrence reporting system. Once an error is identified by staff, nurse, physician, pharmacist etc., they should enter it into the system so issues can be identified for immediate resolution. Since there is not a report that can be run in the EMR to identify the errors we are working based on the assumption that staff are entering these errors when they are identified and not forgetting or relying on someone else to report the error.

Significance

This project will allow the measurement of nurse's knowledge retention over time regarding the admission medication reconciliation process and identify the nurse's perceived barriers. The goal of this quality improvement project is to answer the questions:

1. Admission medication reconciliation knowledge change after educational intervention (difference between pre/post-test)
2. Admission medication reconciliation knowledge retention 60-90 days after the educational intervention
3. Barriers to admission medication reconciliation process
4. Medication errors rates related to admission medication reconciliation pre and post intervention

Theoretical Framework

The Quality-Caring Model© will be used as a guide in the implementation of the project. Dr. Joanne Duffy and Dr. Lois Hoskins developed the Quality-Caring Model© in their work at The Catholic University of America School of Nursing in Washington DC. Duffy and Hoskins (2003) discuss the evidence that

quality outcomes in healthcare have long been associated with nursing care and one of its bases includes the quality improvement model by Donabedian (1988) that focuses on structure, process and outcomes. One of the goals in the development of the model was to incorporate the work and caring nurses perform in their everyday roles and duties into an objective form that could be empirically tested.

Duffy and Hoskins describe the model as; "The scope of the model is broad and is applicable to individual patients and families as well as specialized patient populations" and "Blending the societal need for measurable outcomes with the unique relationship-centered processes" (2003, pp. 86). The model lends support to the nurses achieving quality outcomes for patients in the manner they practice. The model components have implications for the nurse practicing at the bedside, nurse educators, and nursing administrators. For the nurse practicing at the bedside the model brings back the focus of the patient and the importance of the relationship that is established and incorporates caring as a thread through all of the interventions, roles, tasks and assessments (practice) provided. It is essential for the nurse educator to incorporate caring into competency and skill assessments and also into the development of new teaching for students or staff. The model also impacts nursing administrators because they have the responsibility of creating the culture for nurses to practice in this way which can be an enormous challenge as resources become more limited.

The Quality-Caring Model© supports the importance of the nurse's role in this process. In the process phase the nurse is participating in a collaborative relationship as being part of the team within the medication reconciliation process but is also part of an independent relationship. Other members within the organization have the access to enter the list of medications a patient is taking on

admission but currently the culture of the organization is for the nurse to complete this portion of the reconciliation. This portion of the process then can be influenced by the nurse's attitudes, values, and behaviors.

One of the models focuses is the work and caring nursing performs while building a relationship that will gain the trust of the patient. It is essential for the nurse to form a caring relationship to ensure that the patient feels comfortable communicating all medications they are taking including; prescription medications, over the counter medications, herbs, remedies or even illegal drugs. It is also important in this relationship for the nurse to communicate the importance of the patient and family being engaged in their care including knowledge of their medications. Addressing these gaps and providing the tools to nursing will contribute to decreasing medication errors related to the admission medication reconciliation process.

Summary

Medication reconciliation has patient safety implications throughout a patient's hospitalization. The nurse has a significant role in the process that includes home medication information collection and entry which is the foundation for the subsequent steps in the medication reconciliation process. Therefore, there is a need to assess the nurse's knowledge level related to the admission medication reconciliation as well as identify any barriers to their role in the process.

CHAPTER 2: LITERATURE REVIEW

The scope of this project is focused on the nurse's role in the admission medication reconciliation process; including knowledge retention over time following a teaching intervention and nurses perceived barriers to the process. The medication reconciliation concept has remained fairly unchanged but the process for completing this has evolved especially with the implementation of electronic medical records. Healthcare is in a constant state of change with the advances of technology, research updating best practices for patients, and new products. Porter and O'Grady (2011, pg. 465) noted "The times seem filled with activity, change, and movement, responses to ever changing demands for the new and different". Even though the advances may support improvements to patient safety and outcomes there can still be challenges at implementing change.

Jones (2012, pg. 275) noted that "Metrics provide understanding about the performance of a process or function". Multiple organizations and agencies recognize the importance of medication reconciliation and the impact it can have on medication errors. Healthy People 2020 has as a goal to "Increase the proportion of medical surgical hospitals that report adverse drug events" under the medical product safety objective. This goal supports the collection of data so that progress can be benchmarked and tracked.

The Joint Commission (TJC) found the risk for medication reconciliation errors to be of such importance that a National Patient Safety Goals (NPSG) continues for 2014 in the section addressing the improvement of safety in medication use. TJC has identified that the number of patients taking multiple medications and the difficulty in managing these medications creates a safety issue with the medication reconciliation process. The Centers for Medicare and

Medicaid Services (CMS) requires that hospitals must transfer or refer patients, along with necessary medical information, to appropriate facilities, agencies, or outpatient services, as needed, for follow-up or ancillary care. Lastly the Californian Department of Public Health (CDPH) requires hospitals have a Medication Error Reduction Plan Program which encompasses medication reconciliation issues in the medication errors category.

In a 2010 study Porcelli, Waitman and Brown noted in a review of 151 patients' admission medication orders by pharmacists that 53.9% had a minimum of one medication reconciliation discrepancy while another study reviewed 3755 patients and found medication errors in 67% of patients. Medication reconciliation issues are captured in data for medication errors. The Institute of Medicine 2006 report, "Preventing Medication Errors", notes that on average a patient will experience one medication error per day of hospitalization, harming at least 1.5 million patients per year at an estimated cost of 3.5 billion dollars per year.

Data Based Literature

There are numerous studies from different perspectives around the subjects of medication reconciliation, medication errors, and EMR's. Van den Bemt, Van den Scherieck-de Loos, Van der Linden, Theeuwes, and Pol (2013) found a statistically significant reduction in error rates for patients that had the basic medication history obtained by the pharmacy technicians. No effect was found for the patients in the hospitals where basic medication history was obtained by using the mixed model of physicians and pharmacy technicians. Health Care Association of New Jersey (2012) identified a medication management guideline that includes review of labels of all home medications, review of primary physician documentation, and clarification of discrepancies or questionable orders with the source. Staroselskya et al. (2008) noted in a study of medication lists that patient

driven lists on a portal had as many inaccuracies as those driven by health care providers in the EMR. Hayrinena, Sarantoa, and Nykanenb, (2008) noted the EMR's are advantageous to complete and accurate documentation by health care providers.

All of the research studies above were performed thoroughly from the different perspectives. One of the strengths of the studies is that they all included a component of health information technology (HIT) or EMR's. With the government requirements of electronic health record implementation in place it is beneficial for research to include these aspects. This information also brings about a weakness for the research because there is not one standard EMR so the research results may not be completely generalizable to all organizations. The use of the Quality-Caring Model© is in alignment with current and future research in this area. As discussed by Duffy and Hoskins (2003)the evidence that quality outcomes in healthcare have long been associated with nursing care and one of its bases includes the quality improvement model by Donabedian (1988) that focuses on structure, process and outcomes.

In a randomized controlled trial Schnipper, Hamann, Ndumele, Liang, Carty, and Karson (2009) found potential adverse drug events (PADEs) were reduced by the intervention for reconciliation at discharge but not on admission. Researchers identified that the intervention was found to be more successful with patients that were high risk for medication discrepancies. But the intervention was found to be more successful at one hospital than the other. Of concern is the difference in the results between the two study sites. The study description of the two locations describe the rollout process of EMR systems, one in phases and the other in a big bang. Additionally there was time variation in data collection based on the pharmacist's availability.

In a systematic review of 74 articles Waneka and Spetz (2010) noted the quality of nursing documentation improves with HIT, medication errors are reduced by HIT, nurses have a positive attitude about HIT and are mostly satisfied with HIT, participation from nurses at all stages of design and implementation of HIT and effective leadership in the process can improve HIT. The assessment of the studies included five categories; study design, assessment of baseline data, duration of assessment, impact, and control of confounding factors. The review was conducted in a rigorous manner with the possibility of three points awarded in each category for article selection of low, moderate, or high performance.

Many of the same categories in the systematic review are relevant to Quality-Caring Model© components and have implications for the nurse practicing at the bedside, nurse educators, and nursing administrators. For the nurse practicing at the bedside the model brings back the focus of the patient and the importance of the relationship that is established and incorporates caring as a thread through all of the interventions, roles, tasks and assessments (practice) provided. It is essential for the nurse educator to incorporate caring into competency and skill assessments and also into the development of new teaching methodology for students or staff. Lastly the model impacts nursing administrators because they have the responsibility of creating a culture that supports caring nursing practice which can be a challenge as resources become more limited.

Summary

Decreasing admission medication reconciliation errors will have an effect on medication errors that impact patient safety and health care costs. Medication reconciliation is a high risk area for most patients at the transitions in care, admission, transfer, and discharge. With the implementation of EMRs there are more resources in completing an admission medication reconciliation but the

incompleteness and of the inaccuracies of the lists continues. The research indicates that EMR's improve documentation by health care providers, but since issues continue there is strong support for educational interventions to increase the knowledge of staff in using the EMR and its tools. Waneka and Spetz (2010) identified the need for additional evidence of one significant area of the literature as how the nurses' use of HIT affects nursing sensitive patient outcomes.

A common theme that can be identified between this randomized control trial study of Schnipper, Hamann, Ndumele, Liang, Carty, and Karson (2009) and the proposed project is the medication reconciliation process. This study looked at potential errors throughout the admission and discharge phases but the proposed study will focuses solely on the admission medication reconciliation process as it has huge implications of all reconciliations that follow; transfer and discharge. This randomized control trial study included nurses in their teams and the proposed study will also include nurses but they will be the primary population and physicians or pharmacists will not be included in this project. Nurses will be the only target population for the study because they are the primary group that obtain medication history from the patient and enter it into an admission home medication reconciliation list.

CHAPTER 3: METHODOLOGY

The scope of this project is focused on the nurse's role in the admission medication reconciliation process. An educational program that included teaching on the admission medication reconciliation process in the electronic medical record (EMR) was implemented at an acute care hospital. This quality improvement project will focus on the knowledge retention of nurses over time and nurses perceived barriers to the admission medication reconciliation process. Identification of these barriers will facilitate strategy planning to continue to improve the medication reconciliation process.

Method

An educational program that included teaching on the admission medication reconciliation process in the electronic medical record (EMR) was implemented at an acute care hospital. Prior to providing nurses with the educational intervention a pre-test was administered to determine nurse's baseline knowledge of the medication reconciliation process. Following the teaching a post-test was administered to determine if the nurse's knowledge increased. As a quality improvement project this data was accessed retrospectively and after a period of 60-90 days a survey was distributed to measure the nurse's admission medication reconciliation knowledge retention. The survey also included questions to identify barriers to the admission medication reconciliation process.

Project Design

This quality improvement project included retrospective data collection and data collection via a survey. Retrospective data was collected regarding medication errors related to the admission medication reconciliation process. Also retrospective pre and post test data regarding admission medication reconciliation

was collected. The survey included questions regarding; demographic information, admission medication reconciliation knowledge (multiple choice), and questions regarding barriers to the admission medication reconciliation process (Likert scale & ranking scale). The pre-test, post-test, and survey were reviewed by subject matter experts prior to their use. Participation in the survey was voluntary and confidential.

Setting

This quality improvement project was conducted in a medium sized acute care district hospital in California. The hospital has a licensed bed capacity of 269 beds, with an average daily census of approximately 120 patients. The hospital provides critical care, progressive care, general medical surgical care, women's & children's services, outpatient services including emergency care. They hospital is also certified as a: chest pain, stroke, and joint replacement center.

Population and Sample

The participants of this study were selected using a convenience sampling method. There are approximately 650 staff nurses at the acute care hospital where the survey was performed. Inclusion criteria was attendance of the education program that including teaching on the admission medication reconciliation process. The attendance list of staff nurses was collected from the education departments tracking software. Staff that attended but did not complete both a pretest and post test were excluded from the sample. The target population was approximately 431 staff nurses.

Data Collection

The surveys were distributed to staff and a collection envelope was placed on each unit. The survey was delivered in an envelope and included a return envelope labeled with a number that was been assigned to the staff nurse instead

of being labeled with their name. The cover letter included with the survey indicated to the staff nurse that: participation is voluntary, confidentiality will be maintained, and responses are de-identified in the data. Return of the survey by the staff nurse implied informed consent for participation in the study. Reminder emails for completion and submission of the survey were sent out periodically over the six weeks that were allotted for completion. Rounds were made on a weekly basis to pick up completed surveys from the collection envelopes. A total of 87 surveys were returned and data was entered into a SPSS data set.

Data Analysis

The data was analyzed in collaboration with a statistician. Raw data was entered and analyzed using SPSS software. Analysis will include descriptive statistics in addition to analysis to identify any statistically significant relationship related to:

1. Admission medication reconciliation knowledge change after educational intervention (difference between pre/post-test)
2. Admission medication reconciliation knowledge retention 60-90 days after the educational intervention
3. Barriers to admission medication reconciliation process
4. Medication errors rates related to admission medication reconciliation pre and post intervention

Ethical Considerations

The study was approved by the Institutional Review Board at California State University, Fresno. Also the DNP quality improvement project proposal was reviewed by the Research Department at the study hospital. Permission was granted to conduct the study including use of hospital email for communication with staff.

Potential risk associated with participation in the survey is low and unlikely; areas assessed include physical, psychological, and social risks. Risk was further minimized by maintaining open lines of communication regarding the survey being de-identified, and the opportunity to improve the processes in place with the support of staff nurses feedback. Electronic data will be stored in a computer that is password protected and paper data sources will be stored in a locked file cabinet and destroyed following the finalization of the data analysis. Participant's responses will only be used for the study and will not become part of the staff nurses employee file. These precautions are expected to be effective in eliminating the risks associated with participation.

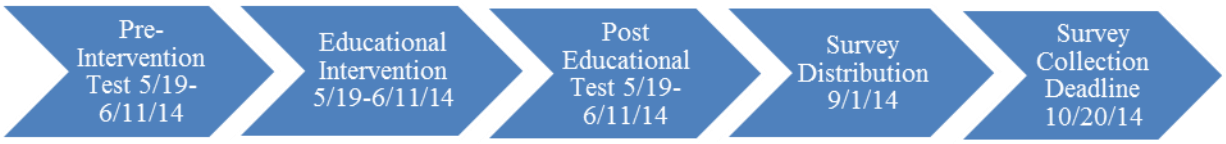
Summary

Potential benefits of conducting the survey include identifying nurse's baseline knowledge and knowledge change at two additional time points after a teaching intervention regarding the admission medication reconciliation process. This would assist in identifying areas in the process that staff are having difficulty understanding. Staff feedback regarding barriers to the admission medication reconciliation process will assist in strategizing for future process changes and education. Additionally although huge inferences cannot be made we will have some insight regarding medication errors rates related to admission medication reconciliation pre and post education intervention. Although medication reconciliation is a process that has been in place and a regulatory requirement for some time it still challenging for most organizations, new strategies may be beneficial to other organizations and patient outcomes.

CHAPTER 4: RESULTS

The focus of this QI project is on the knowledge retention of nurses over time and nurses perceived barriers to the admission medication reconciliation process. Data was collected retrospectively from a pre and post test that were given at the beginning and at the end of an educational intervention that included the admission medication reconciliation process. Approximately 81-104 (depending on when the staff attended the class) days following the educational intervention a survey was distributed to staff that attended the course to measure the level of knowledge retention at a third point in time and perceived barriers to compliance. The timeline in Figure 1 delineates the process from the educational intervention to the collection of the surveys.

Figure1. Timeline



The data was analyzed using SPSS software. Analysis included descriptive statistics in addition to analysis to identify any statistically significant relationship related to the QI project questions:

1. Admission medication reconciliation knowledge change after educational intervention (difference between pre/post-test)
2. Admission medication reconciliation knowledge retention 60-90 days after the
   educational intervention
3. Barriers to admission medication reconciliation process

4. Medication errors rates related to admission medication reconciliation pre and post intervention

Statistical data will be presented along with the timeframe pairings and include:

- Demographic Data
- Knowledge retention in paired t tests
- Comfort levels in paired t tests
- Descriptive data for Barriers
- 2014 Medication error data

Statistics and Data

Participant's demographic information was collected in the survey and included gender, age group, specialty unit, years as a registered nurse, and highest education level. The results for these demographics are included in Figures 2-6.

Figure 2. Gender

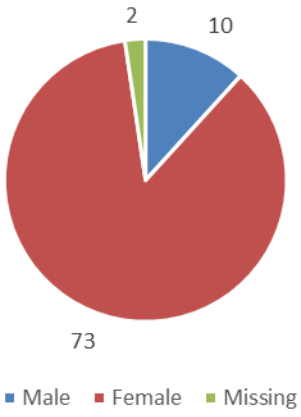
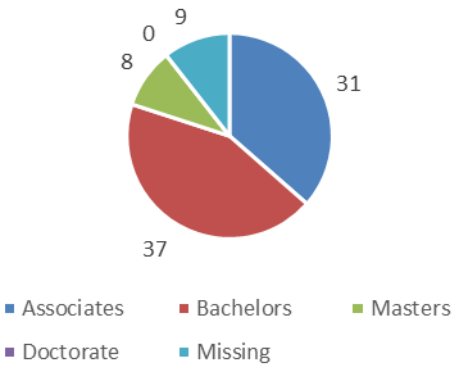


Figure 3. Highest Educational Level



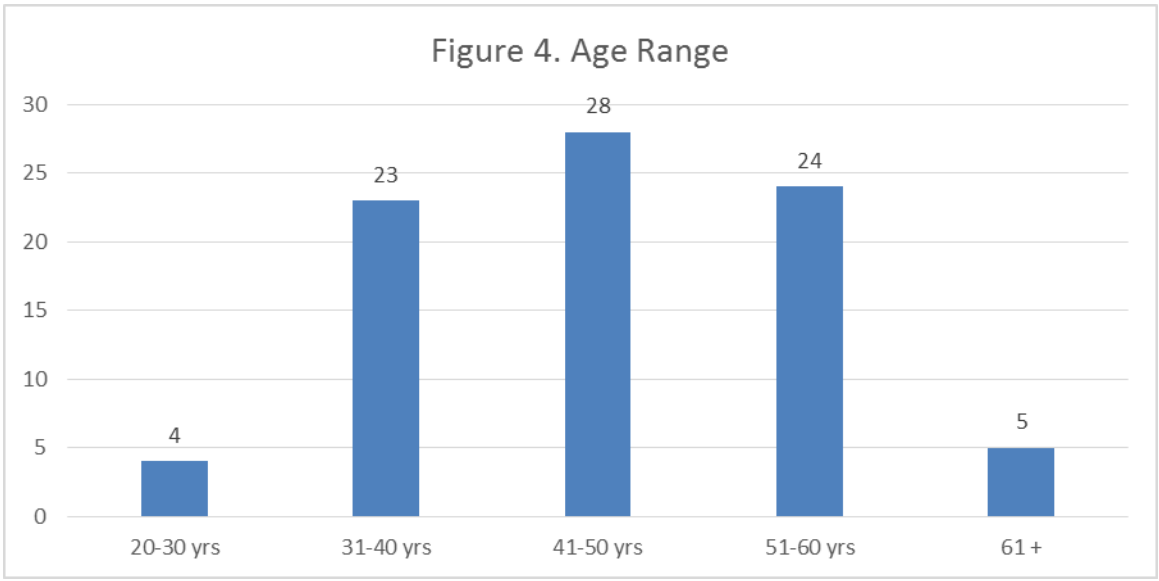


Figure 4. Age Range
30
25
20
15
10
5
0
4
23
28
24
5
20-30 yrs
31-40 yrs
41-50 yrs
51-60 yrs
61 +

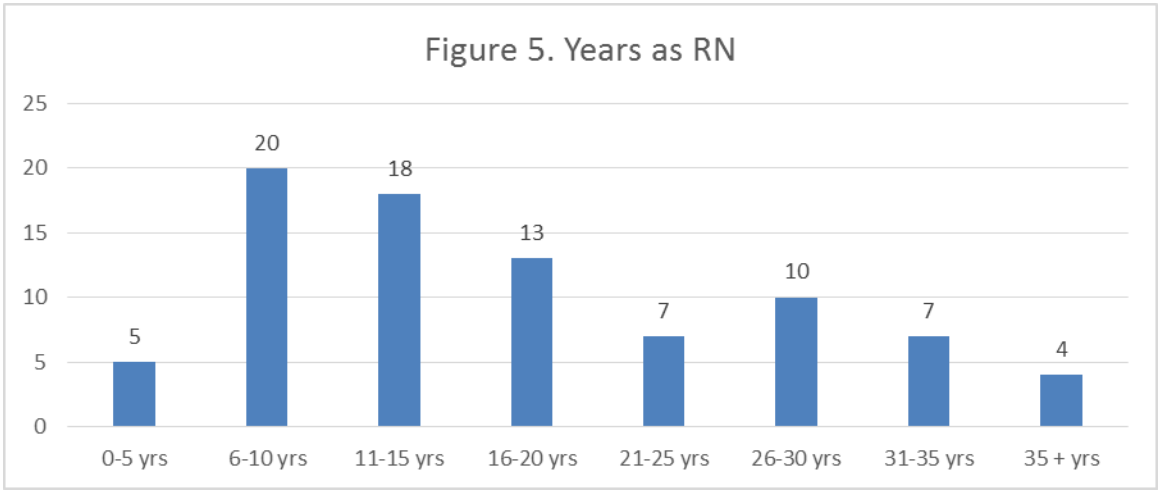
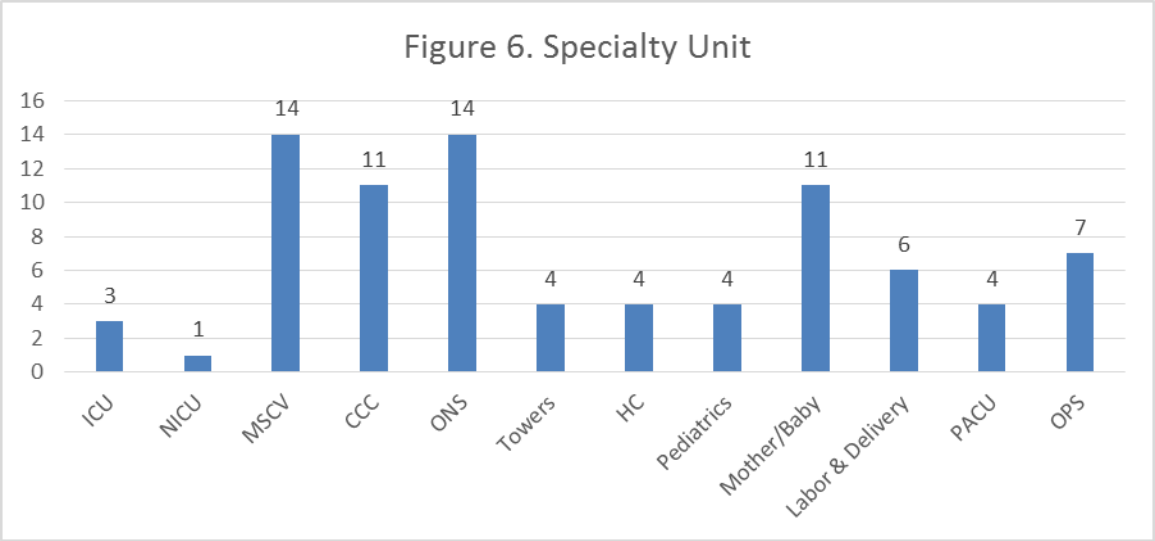


Figure 5. Years as RN
25
20
15
10
5
0
5
20
18
13
7
10
7
4
0-5 yrs
6-10 yrs
11-15 yrs
16-20 yrs
21-25 yrs
26-30 yrs
31-35 yrs
35 + yrs



There were ten knowledge retention and comfort level questions repeated on the pre-test (Appendix A), post-test (Appendix B), and survey (Appendix C). Included are the focus areas and the specific questions that address each of these areas:

1. Purpose of medication reconciliation (Question 1)
2. Time frame for obtaining home medication information (Question 2)
3. Goal of the medication reconciliation process (Questions 3)
4. Entering medication information (Question 4-6)
5. Comfort level with computer literacy, medication reconciliation, the medication reconciliation process in the electronic medical record, and navigating the electronic medical record (Question 7-10)

The repeated question were analyzed using paired sample t tests statistical design. The pairings were as follows:

- Pair 1 = Pre-Test and Post-Test
- Pair 2 = Pre-Test and Survey
- Pair 3 = Post Test and Survey

This method was selected to measure if there were statistically significant results of the nurse's knowledge retention regarding the admission medication reconciliation process. The first paired question (one) is shown in Table 1. Results showed statistically significant results of knowledge retention for pair 1 and 3, pair 2 was not statistically significant.

Table 1

Question 1 - Purpose of Medication Reconciliation

	n	mean	SD	t	df	Sig. (2-tailed)
Pair 1				-3.768	82	0.000
Pre-Test	83	0.7711	0.42269			
Post-Test	83	0.9398	0.23938			
Pair 2				-0.893	82	0.374
Pre-Test	83	0.7711	0.42269			
Survey	83	0.8193	0.38713			
Pair 3				2.776	84	0.007
Post-Test	85	0.9412	0.23669			
Survey	85	0.8235	0.38348			

Results for question two (Table 2) showed statistically significant results of knowledge retention for pair 1, 2, and 3.

Table 2

Question 2 - Time Frame for Obtaining Home Medication Information

	n	mean	SD	t	df	Sig. (2-tailed)
Pair 1				-7.193	82	0.000
Pre-Test	83	0.4819	0.50271			
Post-Test	83	0.8916	0.31282			
Pair 2				-3.221	82	0.002
Pre-Test	83	0.4819	0.50271			
Survey	83	0.6867	0.46664			
Pair 3				4.028	84	0.000
Post-Test	85	0.8941	0.30951			
Survey	85	0.6941	0.46351			

Results for question three (Table 3) showed no statistically significant results of knowledge retention for any of the pairs.

Table 3

Question 3 - Goal of the Medication Reconciliation Process

	n	mean	SD	t	df	Sig. (2-tailed)
Pair 1				*	*	*
Pre-Test	83	1	0.00000			
Post-Test	83	1	0.00000			
Pair 2				1	82	0.320
Pre-Test	83	1	0.00000			
Survey	83	0.9880	0.10976			
Pair 3				1	84	0.320
Post-Test	85	1	0.0000			
Survey	85	0.9882	0.1085			

* Not able to calculate as responses were all correct on pre & post-test

Results for question four (Table 4) showed statistically significant results of knowledge retention for pair 1, pairs 2 and 3 were not statistically significant.

Table 4

Question 4 - Selecting Medication Strings

	n	mean	SD	t	df	Sig. (2-tailed)
Pair 1				-3.352	82	.001
Pre-Test	83	0.8554	0.35381			
Post-Test	83	0.9759	0.15428			
Pair 2				-1.296	82	0.199
Pre-Test	83	0.8554	0.35381			
Survey	83	0.9157	0.27958			
Pair 3				1.685	84	0.096
Post-Test	85	0.9765	0.15248			
Survey	85	0.9176	0.27653			

Results for question five (Table 5) showed statistically significant results of knowledge retention for pairs 1, 2, and 3.

Table 5

Question 5 - Use of Patient Comments Section

	n	mean	SD	t	df	Sig. (2-tailed)
Pair 1				-7.804	82	0.000
Pre-Test	83	0.4578	0.50125			
Post-Test	83	0.9277	0.26054			
Pair 2				-2.558	80	0.012
Pre-Test	81	0.4568	0.50123			
Survey	81	0.6296	0.48591			
Pair 3				5.363	82	0.000
Post-Test	83	0.9277	0.26054			
Survey	83	0.6265	0.48667			

Results for question six (Table 6) showed statistically significant results of knowledge retention for pairs 1 and 3, pair 2 was not statistically significant.

Table 6

Question 6 - Number of Entries for Different Medication Dosages

	n	mean	SD	t	df	Sig. (2-tailed)
Pair 1				-3.440	71	0.001
Pre-Test	72	0.7083	0.45772			
Post-Test	72	0.8750	0.33304			
Pair 2				-1.043	70	0.300
Pre-Test	71	0.7183	0.45302			
Survey	71	0.7887	0.41111			
Pair 3				2.108	80	0.038
Post-Test	81	0.8642	0.34471			
Survey	81	0.7531	0.4339			

Results for the ranking of staff comfort level with computer literacy (Table 7) showed no statistically significant results for pairs 1, 2, and 3. The mean rating at the three time points indicated staff feel comfortable with their level of computer literacy.

Table 7

Question 7 - Comfort Level with Computer Literacy

	n	mean	SD	t	df	Sig. (2-tailed)
Pair 1				0.228	66	0.821
Pre-Test	67	3.0448	0.84267			
Post-Test	67	3.0299	0.83431			
Pair 2				-1.229	68	0.223
Pre-Test	69	3.0435	0.84774			
Survey	69	3.1304	0.70530			
Pair 3				-1.000	77	0.320
Post-Test	78	3.0769	0.81813			
Survey	78	3.1410	0.69739			

Results for the ranking of staff comfort level with medication reconciliation (Table 8) showed statistically significant results for pairs 1 and 2, and no statistical significance for pair 3. The mean rating at the three time points indicated staff feel somewhat comfortable to comfortable with medication reconciliation.

Table 8

Question 8 - Comfort Level with Medication Reconciliation

	n	mean	SD	t	df	Sig. (2-tailed)
Pair 1				-3.200	66	0.002
Pre-Test	67	2.7015	0.81677			
Post-Test	67	2.9701	0.79716			
Pair 2				-4.057	68	0.000
Pre-Test	69	2.7101	0.82429			
Survey	69	3.0290	0.70650			
Pair 3				-0.630	77	0.531
Post-Test	78	2.9744	0.75549			
Survey	78	3.0256	0.68328			

Results for the ranking of staff comfort level with the medication reconciliation in the electronic medical record (Table 9) showed statistically significant results for pairs 1 and 2, and no statistical significance for pair 3. The mean rating at the three time points indicated staff feel somewhat comfortable to comfortable with medication reconciliation in the electronic medical record.

Table 9

Question 9 - Comfort Level with Medication Reconciliation in the Electronic Medical Record

	n	mean	SD	t	df	Sig. (2-tailed)
Pair 1				-4.500	65	0.000
Pre-Test	66	2.5152	0.84567			
Post-Test	66	2.9394	0.82048			
Pair 2				-4.885	67	0.000
Pre-Test	68	2.5294	0.85467			
Survey	68	2.8971	0.77536			
Pair 3				0.478	77	0.634
Post-Test	78	2.9231	0.78574			
Survey	78	2.8846	0.7556			

Results for the ranking of staff comfort level with navigating the electronic medical record (Table 10) showed statistically significant results for pairs 1 and 2, and no statistical significance for pair 3. The mean rating at the three time points indicated staff feel somewhat comfortable to comfortable with navigating the electronic medical record.

Table 10

Question 10 - Comfort Level with Navigating the Electronic Medical Record

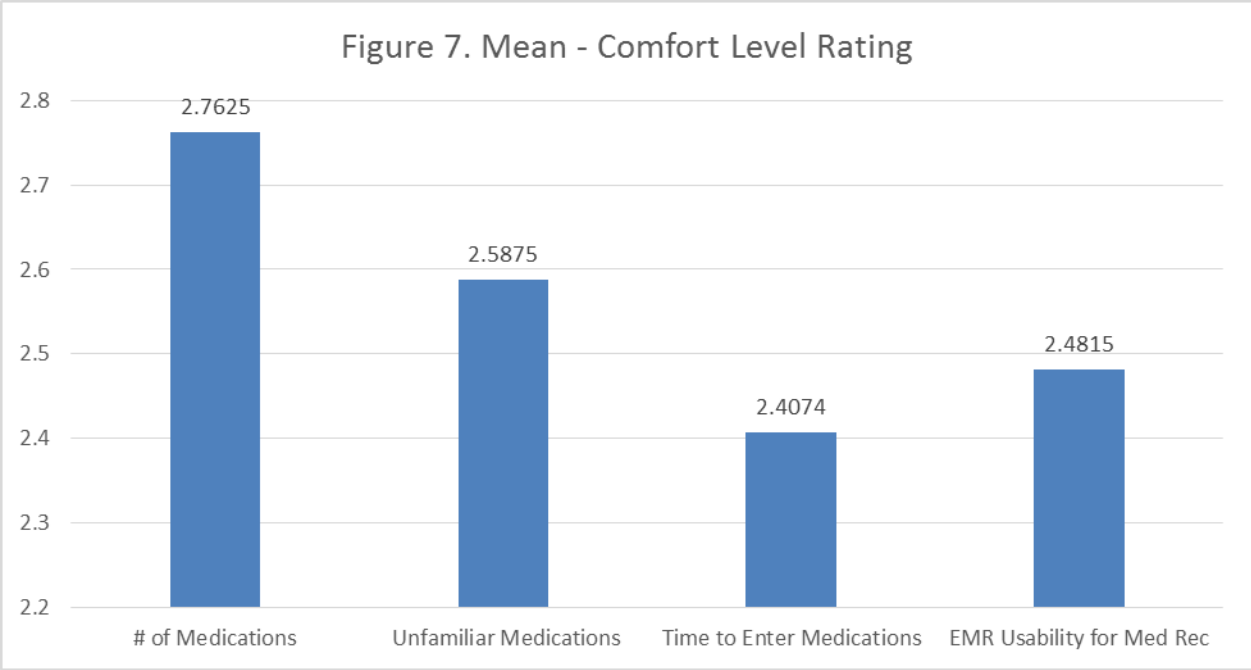
	n	mean	SD	t	df	Sig. (2-tailed)
Pair 1				-2.832	66	0.006
Pre-Test	67	2.6866	0.94081			
Post-Test	67	2.9104	0.81150			
Pair 2				-2.721	66	0.008
Pre-Test	67	2.7313	0.93066			
Survey	67	2.9254	0.74495			
Pair 3				0.207	74	0.836
Post-Test	75	2.9200	0.78431			
Survey	75	2.9067	0.71986			

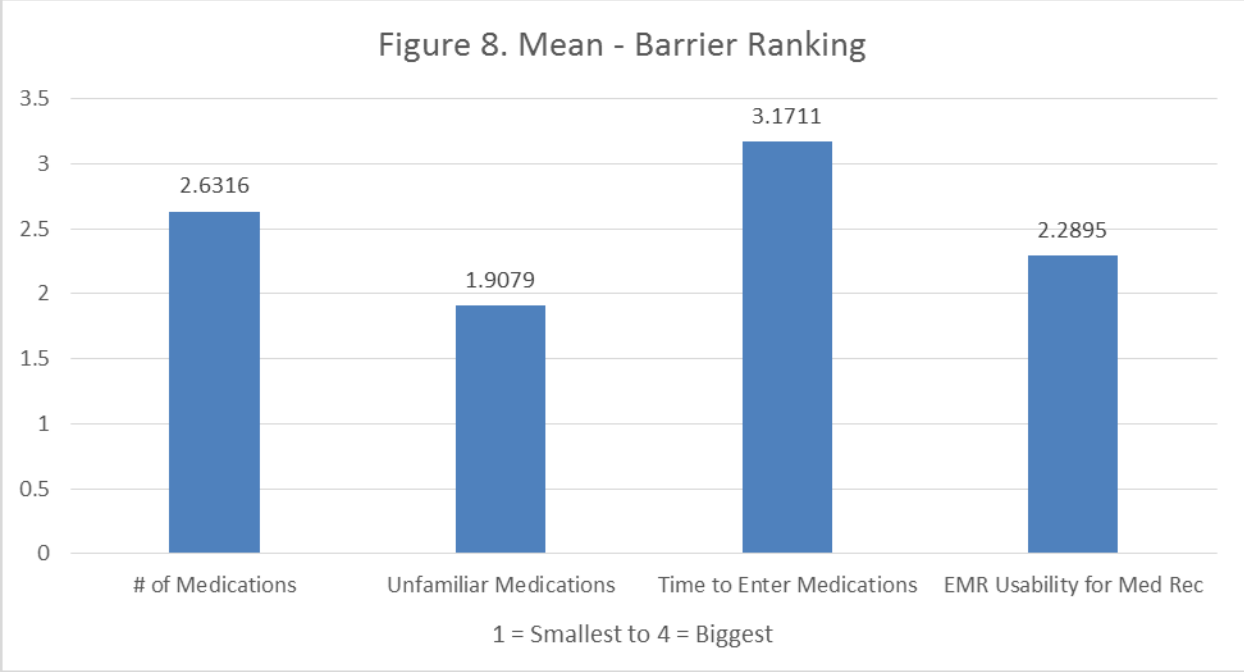
Barrier Results

Participants were asked in the survey to rank and rate the following barriers to the medication reconciliation process:

1. Number of medications
2. Unfamiliar medications
3. Time to enter medication information
4. Electronic Medical Record usability for medication reconciliation

These barriers selected were selected for the questions because they had been previously identified in the literature. The mean of the barrier rating (Figure 7) and barrier ranking (Figure 8) identify the time to enter home medication information as the greatest barrier for staff in the medication reconciliation process.



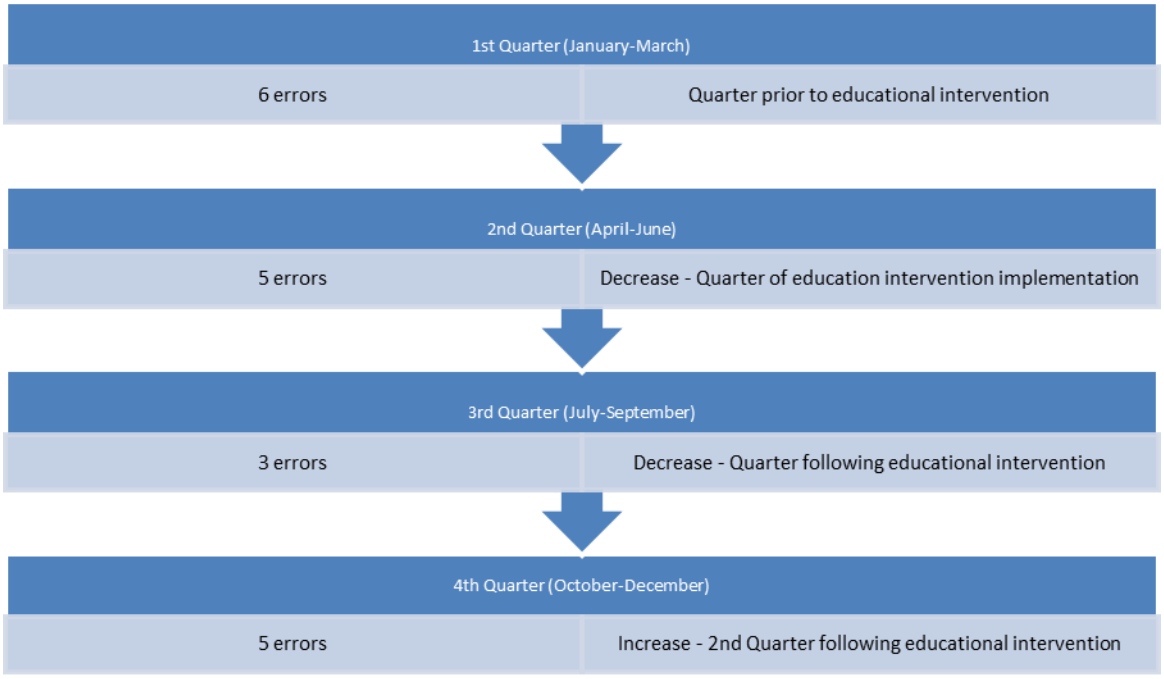


Medication Errors

Medication error rates are monitored and categorized by the organization to identify trends. These medication error reports are gathered through staff reporting

through an occurrence reporting system. Medication error rates (Figure 9) related to the medication reconciliation process show a slight decrease in the quarter during the educational intervention and the following quarter but errors increase in the last quarter of the year.

Figure 9. Medication Error Rates



Data Analysis and Discussion

The results of the performance improvement project have implications for both clinical practice and educational interventions. The results can be generalized to nurses participating in the admission medication reconciliation process by entering home medication information in an electronic medical record. The data analysis showed a mix of statistically significant and non- significant results for nurses knowledge retention over time related to the admission medication

reconciliation process. A discussion will follow on the results as they relate to the four QI project questions.

Knowledge Retention Pre-Test and Post-Test

For pairings of the pre-test and post-test five of the six questions were statistically significant. There was not statistically significant change for the question related to the goal of the medication reconciliation process because all participants answered the questions correctly on the pre-test and post-test. The increase in knowledge was for the following QI project questions:

1. Purpose of medication reconciliation (sig. 0.000)
2. Time frame for obtaining home medication information (sig. 0.000)
3. Selecting medication strings (sig. 0.001)
4. Use of patient comments section (sig. 0.000)
5. Number of entries for different medication dosages (sig. 0.001)

It can be inferred that the nurse's knowledge increased from prior to the educational intervention (pre-test) and they retained the information immediately after the educational intervention (post-test).

Knowledge Retention at Survey

For pairing of the pre-test and survey two of six questions were statistically significant. Staff showed significant knowledge retention from pre-test to survey in the focus areas of time frame for obtaining home medication information (sig. 0.002) and use of the patient comment section (sig. 0.012). The other four questions did not have enough of an increase from pre-test to survey to be found statistically significant.

For pairings of the post-test and survey questions four of the six were statistically significant. Staff had a statistically significant retention of knowledge from their post-test to their survey on QI project questions:

1. Purpose of medication reconciliation (sig. 0.007)
2. Time frame for obtaining home medication information (sig. 0.000)
3. Use of patient comments section (sig. 0.000)
4. Number of entries for different medication dosages (sig. 0.038)

The other two questions did not have enough of an increase from post-test to survey to be found statistically significant.

Comfort Levels

The results of the comfort levels over time showed some instances of statistical significance. Staff rated their computer literacy level fairly high (all means >3) with no statistically significant changes at the different time points inferring that the intervention had no impact for them on computer literacy. Staff rated their comfort with medication reconciliation, medication reconciliation in the electronic medical record, and navigating the electronic medical record between somewhat comfortable and comfortable (all means> 2.5). These three also had statistically significant results for the pairings of pre and post-test, and pre-test and survey. There was not statistical significance for these three at the pairing of post-test and survey. It can be inferred that the participants comfort level was increased from the pre-test measurement but there was not a significant increase following the post test.

Barriers to Admission Medication Reconciliation Process

Staff were asked to rate and rank four barriers to the admission medication reconciliation process so the priorities can be set. The greatest barrier identified by staff was the time it takes to enter home medication information in the electronic medical record. The time to enter medications barrier had the lowest comfort level mean (2.4074) and the highest barrier ranking (3.1711). These results and the Quality-Caring Model© support administrations intervention to address this

priority barrier by creating a culture that supports the nurses role in the admission medication reconciliation process and the accurate, timely, and complete entry of admission home medication information.

Medication Error Rates

The medication error rate related to the admission medication reconciliation process was collected by quarter for 2014. The quarter prior to the educational intervention showed a baseline of 6 medication errors. In the quarter during the implementation of the education intervention there is a slight decrease of medication errors, down to 5 errors. Then in the 3rd quarter, which falls into the 60-90 day survey following the educational intervention, the errors continue to decrease down to 3. It can be inferred that the decrease in errors coincides with the educational intervention and the time from after supported by the results of knowledge retention at the time of the survey. In the fourth quarter (2nd quarter following the educational intervention) the number of medication errors began to increase. There is no data for knowledge retention for this time period so we cannot compare retention and the error rates.

Implications for Nursing Practice

Additional methodologies should be considered for teaching and staff support in an effort to increase nurse's knowledge retention over time. Current resources available related to the process should be reviewed with staff so they are able to access them as needed to complete the home medication information entry. The expert resource available to staff are the pharmacists that are familiar with the entry of medication information entry, and are decentralized from the pharmacy and stationed on various nursing units. Tip sheets reviewing the entry of home medication information and frequently asked questions are available on the

organization intranet for the staff to refer to. There also is support provided from the clinical informatics team through a manned phone.

Additional follow-up with staff should be done to identify what can be done to maintain the staffs comfort level with medication reconciliation, medication reconciliation in the electronic medical record, and navigation of the electronic medical record over time. Also further information should be gathered regarding this barrier by follow up with staff at the bedside entering the home medication information, this can include interviews, additional surveys, and work flow analysis. Strategies can be identified to mitigate the barrier and be implemented in rapid cycle improvement project approach.

Limitations

This quality improvement project is not without limitations. The first limitation to note is the challenge to assess nurse's knowledge of the medication reconciliation process in the electronic medical record when the systems are frequently being changed due to updates. The updates to the system are typically improvements but changes equate for new information for all the nurses to learn. Another limitation to consider is the number of medication error rates related to the medication reconciliation process. The errors are reported by staff in an occurrence reporting system and there is an assumption that all the medication errors related to the admission medication reconciliation process are discovered and reported.

Summary

The scope of this quality improvement project was focused on the nurse's role in the admission medication reconciliation process. Medication reconciliation has implications for patient safety and the importance is supported by requirements from organizations such as TJC, CMS, and CDPH. The results of the

project will used to guide actions for the next steps in supporting nurses in the admission medication reconciliation process.

The QI project was completed with registered nurses in a 269 bed acute care facility. Retrospective data was collected from a pre-test and post-test that were administered before and after an educational intervention. This was followed by a survey to measure knowledge retention and identify barriers to the process. The data was collected, entered, and analyzed using SPSS software for descriptive data and paired sample t-tests. The results support the continued focus on the admission medication reconciliation process for the benefit of both nurses and patients.

The accurate, timely and complete performance of the medication reconciliation process is essential for patient safety. In this organization nurses play a significant role in the process by entering the home medication information on admission. The electronic medical record has added another layer of complexity and transparency to the admission medication reconciliation process. Barriers and strategies should be identified and further investigated to provide support for nurses and improve patient outcomes by decreasing medication errors related to the admission medication reconciliation process.

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APPENDICES

APPENDIX A: PRE-TEST

1. Medication reconciliation is the process of reviewing and reconciling the patient's current medications with what the patient is taking at transitions of care;
    a. Admission
    b. Discharge
    c. Admission & Discharge
    d. Admission, Transfer, & Discharge

2. On admission a good faith effort to obtain the home medication information from the patient and/or other knowledgeable sources should be made for
    a. Shift of admission
    b. During discharge
    c. 24 hours
    d. 48 hours

3. The goal of the reconciliation process is to prevent medication errors resulting from
    a. Drug interactions
    b. Dosing errors
    c. Duplications
    d. Omissions
    e. All of the above

4. When entering a medication on the list of home meds the string (drug name and drug elements) that is closest to what the patient takes should be selected and then edited if necessary.
    a. True
    b. False

5. The patient comments section in the home medication list should be used to enter information that is important for the physician to know for ordering.
    a. True
    b. False

6. During the home medication reconciliation the patient reports taking Warfarin 2.5mg Monday, Wednesday & Friday and 2mg Tuesday, Thursday & Saturday and none on Sunday. How would you enter this in the EMR?
    a. One entry with the specific information included in patients comments
    b. Two entries, one for each dose
    c. Three entries, one for MoWeFr, one for TuThSa, and one for Sunday

Please rate your comfort level for the following:

7. Computer literacy	Not Comfortable	Somewhat Comfortable	Comfortable	Very Comfortable
8. Medication reconciliation	Not Comfortable	Somewhat Comfortable	Comfortable	Very Comfortable
9. Medication reconciliation process in Meditech	Not Comfortable	Somewhat Comfortable	Comfortable	Very Comfortable
10. Navigating the EMR	Not Comfortable	Somewhat Comfortable	Comfortable	Very Comfortable

APPENDIX B: POST-TEST

1. Medication reconciliation is the process of reviewing and reconciling the patient's current medications with what the patient is taking at transitions of care;
    a. Admission
    b. Discharge
    c. Admission & Discharge
    d. Admission, Transfer, & Discharge

2. On admission a good faith effort to obtain the home medication information from the patient and/or other knowledgeable sources should be made for
    a. Shift of admission
    b. During discharge
    c. 24 hours
    d. 48 hours

3. The goal of the reconciliation process is to prevent medication errors resulting from
    a. Drug interactions
    b. Dosing errors
    c. Duplications
    d. Omissions
    e. All of the above

4. When entering a medication on the list of home meds the string (drug name and drug elements) that is closest to what the patient takes should be selected and then edited if necessary.
    a. True
    b. False

5. The patient comments section in the home medication list should be used to enter information that is important for the physician to know for ordering.
    a. True
    b. False

6. During the home medication reconciliation the patient reports taking Warfarin 2.5mg Monday, Wednesday & Friday and 2mg Tuesday, Thursday & Saturday and none on Sunday. How would you enter this in the EMR?
    a. One entry with the specific information included in patients comments
    b. Two entries, one for each dose
    c. Three entries, one for MoWeFr, one for TuThSa, and one for Sunday

Please rate your comfort level for the following:

7. Computer literacy	Not Comfortable	Somewhat Comfortable	Comfortable	Very Comfortable
8. Medication reconciliation	Not Comfortable	Somewhat Comfortable	Comfortable	Very Comfortable
9. Medication reconciliation process in Meditech	Not Comfortable	Somewhat Comfortable	Comfortable	Very Comfortable
10. Navigating the EMR	Not Comfortable	Somewhat Comfortable	Comfortable	Very Comfortable

APPENDIX C: SURVEY

Demographics:

Gender: Male Female

Age: 20 - 30yrs 31 - 40yrs 41 - 50yrs 51 - 60yrs 61+ yrs

Specialty / Nursing Unit: _____

Years as a RN: 0 - 5yrs 6 - 10yrs 11 - 15yrs 16 -20yrs

21 - 25yrs 26 - 30yrs 31 – 35yrs 35+yrs

Highest Educational Level: Associates Bachelors Masters Doctorate

Admission Medication Reconciliation Knowledge Questions:

1. Medication reconciliation is the process of reviewing and reconciling the patient's current medications with what the patient is taking at transitions of care;
    a. Admission
    b. Discharge
    c. Admission & Discharge
    d. Admission, Transfer, & Discharge

2. On admission a good faith effort to obtain the home medication information from the patient and/or other knowledgeable sources should be made for
    a. Shift of admission
    b. During discharge
    c. 24 hours
    d. 48 hours

3. The goal of the reconciliation process is to prevent medication errors resulting from
    a. Drug interactions
    b. Dosing errors
    c. Duplications
    d. Omissions
    e. All of the above

4. When entering a medication on the list of home meds the string (drug name and drug elements) that is closest to what the patient takes should be selected and then edited if necessary.
    a. True
    b. False

5. The patient comments section in the home medication list should be used to enter information that is important for the physician to know for ordering.
    a. True
    b. False

6. During the home medication reconciliation the patient reports taking Warfarin 2.5mg Monday, Wednesday & Friday and 2mg Tuesday, Thursday & Saturday and none on Sunday. How would you enter this in the EMR?
    a. One entry with the specific information included in patients comments
    b. Two entries, one for each dose
    c. Three entries, one for MoWeFr, one for TuThSa, and one for Sunday

Please rate your comfort level for the following:

7. Computer literacy	Not Comfortable	Somewhat Comfortable	Comfortable	Very Comfortable
8. Medication reconciliation	Not Comfortable	Somewhat Comfortable	Comfortable	Very Comfortable
9. Medication reconciliation process in Meditech	Not Comfortable	Somewhat Comfortable	Comfortable	Very Comfortable
10. Navigating the EMR	Not Comfortable	Somewhat Comfortable	Comfortable	Very Comfortable

Please rate whether the following are barriers to the admission medication reconciliation process:

1. Number of medications patient takes	Not Comfortable	Somewhat Comfortable	Comfortable	Very Comfortable
2. Patient taking medications that are unfamiliar to you	Not Comfortable	Somewhat Comfortable	Comfortable	Very Comfortable
3. Time it takes to enter the home medications	Not Comfortable	Somewhat Comfortable	Comfortable	Very Comfortable
4. System (EMR) usability for medication reconciliation	Not Comfortable	Somewhat Comfortable	Comfortable	Very Comfortable

Place the following list in order of biggest to smallest barrier. (1)=biggest & (4)=smallest

Number of medications patient takes: _____

Patient taking medications that are unfamiliar to you: _____

Time it takes to enter the home medications: _____

System (EMR) usability for medication reconciliation _____