Eliminating Medication Errors in Nursing Practice with an Innovative Quality Improvement Tool Proposal

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If nursing students/nurses use a developed tool targeting and walking through of all 5 rights of medication administration, step by step, there will be a decrease in medication errors. The utmost goal that nurses hold in their practice is to provide the highest quality of care possible, in order to achieve the best patient outcomes. Many barriers exist when it comes to maintaining optimum quality of care. However, one that is extremely prevalent in today’s practice is related to errors with medication administration. Failure to complete any of the five rights to administration is considered a medication error. Whether it be the route, the dose, the drug itself, the patient, or the time, a medical error in any of these categories can lead to severe adverse effects that could possibly lead to injury of the patient or possibly death. The cause of medication errors is quite variable, and a practical solution is needed in order to help guide nurses in avoiding medication errors and the related adverse events. After completing a thorough literature review, I will take the research found and apply the knowledge to develop and propose a basic safety and quality improvement intervention that will help in elimination medication errors.
Eliminating Medication Errors in Nursing Practice

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School of Nursing: Undergraduate BSN Program

Upper Division Honors Capstone Project

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Introduction

The utmost goal that nurses hold in their practice is to provide the highest quality of care possible, in order to achieve the best patient outcomes. Many barriers exist when it comes to maintaining optimum quality of care. However, one that is extremely prevalent in today’s practice is related to errors with medication administration. Failure to complete any of the five rights to administration is considered a medication error. Whether it be the route, the dose, the drug itself, the patient, the time, or the documentation, a medical error in any of these categories can lead to severe adverse effects that could possibly lead to injury of the patient or possibly death. The cause of medication errors is quite variable and a practical solution is needed in order to help guide nurses in avoiding medication errors and the related adverse events.

Nurses are human and the one thing we know is that humans are not perfect. It is said that “To err is human”, meaning we will make mistakes regardless of training (Shohani & Tavan, 2018, p. 1). An error occurs when something goes wrong with the properly planned action. In order to truly understand medication errors, it is necessary to attain a complete understanding of the characteristics of the error and to prevent the errors with the creation of technologies and strategies (Ferreira, et al., 2014, p. 726). According to Ferreira et al, about 88% of patients seeking care, receive some sort of medication (Ferreira, et al., 2014, p. 726). With this statistic, it can be presumed that medication administration is one of the most commonly used intervention when giving care to a patient. In the United States, about “3-6.9% of hospitalized patients” experience a medication error, which leaves the estimation to be “at least one death per day” due to such error (Shohani & Tavan, 2018, p. 1). Due to the adverse events that medication errors cause, whether it be minor or as severe as morbidity, it’s of utmost importance to study medication errors and ways to prevent them.
After completing a thorough literature review, I will take the research found and apply the knowledge to develop and propose a basic safety and quality improvement intervention that will help in elimination medication errors.
Part A: Literature Review

Methodology

The research below focuses on two aspects: what causes medication errors and interventions being used to reduce medication errors. This literary review was comprised of data/information taken from Scholarly Articles. The database used to look up the articles was Ebsco Host. Key words/phrases that were used to access the following studies were “Medication Errors, Patient Safety, Nursing Practice, Prevention of Medication Errors”. Seven articles were reviewed in the process. Three articles were Descriptive Exploratory quantitative research, two articles were Cross Sectional quantitative research, one article was Descriptive Exploratory qualitative research, and one article was an integrative review. All participants in the studies were in the healthcare field, whether they were a nursing student or a health care professional. The settings of the following were university hospitals located in the city of Ilam in Iran, the city of Natal in Rio Grande, Sao Paulo state, southern Brazil, Canada, and Tennessee in the United States. The results were then categorized into factors causing medication errors and interventions to reduce medication errors.

Results

What Causes Medication Errors

Human error is inevitable; however, most errors can be prevented. Medication errors have been defined as a “preventable event that may cause or lead to inappropriate medical use or patient harm, while the medication is under control of a professional of the patient” (Ferreira, et al., 2014, p. 730). A key component in preventing medication error is proper identification of what exactly causes them. Three main caused identified from the studies was Insufficient
Knowledge regarding medication errors, Reporting of Errors for further education, and Nurse related factors that cause the Errors.

Identifying medication errors is important in further prevention and reduction of adverse events. One of the studies aimed to analyze and depict how many health care professionals could identify medication errors and the relation the error has to an adverse event. Using a quantitative approach, this descriptive exploratory study, studied 29 nurses in a university hospital in the city of Natal, Rio Grande do Norte, using data collected from observations and participatory review. Of the 29 nurses, 82.9% of them could not distinguish the relation between a medical error and an adverse event (Ferreira, et al., 2014, p. 729). For example, adverse events such as, skin changes including rashes, redness, and petechiae, changes in vital signs including temperature, blood pressure, heart rate, and respiration rate, changes in level of consciousness, and patient discomfort (Ferreira, et al., 2014, p. 729). Medication administration is very complex and being able to identify errors and the adverse events that follow are necessary when providing safe patient care. In this study, it is claimed and proven that the knowledge regarding medication errors by nurses is crucial in promoting the “discovery” and the “elaboration/implementation” of measures to prevent such events (Ferreira, et al., 2014, p. 730). The results of the study showed that there definitely needs to be knowledge of human errors in the administration of medications in order to perceive the error. In doing so, one needs to take into consideration all the related causes to such errors, such as: “lack of knowledge about medicines, lack of information about patients, violation of rules, slippage and lapses of memory, transcription errors, flaws in interaction with other services, failures in the doses of administration, problems related to the drug infusion devices, inadequate patient monitoring, storage and dispensing problems, staging errors and lack of standardization of medicines” (Ferreira, et al., 2014, p. 732). Not only does
little knowledge increase the risk of unsafe practice, but also limits nurses’ ability to properly report the error for future prevention. Which is the next area within causes of medication errors.

Reporting medication errors is a form communication that is needed among all health care professionals in order to provide efficient care. In a quantitative, exploratory descriptive study, 49 nurses in a public university hospital in Brazil, analyzed the occurrence of medication errors in nursing using descriptive and inferential statistics. Of the 85.7% of nurses that said they experienced some medication error in their work unit, only 61.5% of them said that they reported the medication error that occurred on their unit (Aires, et al., 2016, p. 4574). Reporting medication errors is the base for effective communication among the inter-professional team. It was found in the study that “ineffective communication among health professionals” was a source of the occurrence of medication errors in an average 4.73 of 49 nurses (Aires, et al., 2016, p.4575). Reporting errors is important because when errors aren’t reported, a barrier is created for teaching and prevention of repeated medication errors. The recognition of errors when they occur and the communication back to the team is key in preventing future errors and implementing safer practices. According to this study, one reason why medication errors are not reported is because there are hospitals that still do not require the errors to be notified and those hospitals show a greater number of adverse events (Aires, et al., 2016, p.4576). Another reason some errors may not be reported is due to guilt or fear of being reprimanded. It is crucial to address the guilt and fear in order to encourage the notifying the errors, thus allowing the ability to anticipate future errors and possibly correct the error before harm or injury to the patient. When reporting does not occur, that lack of communication among the team and lack of further knowledge of safe administration, is a primary cause for continued medication errors.
There were two studies that dived into the specific factors that cause the errors in medication administration. One study was a cross-sectional, descriptive analytical quantitative study, that analyzed 128 randomly selected nurses from a university hospital in Ilam, Iran, with a two part standard questionnaire regarding the most frequent factors causing medication errors (Shohani & Tavan, 2018, p.1). Many factors were studied and analyzed, however, of the 22 proposed factors, there were 9 factors that had a high perception of occurrence of medication errors among the observed nurses. They are as follows: Insufficient numbers of nurses to attend to patients, Fatigue related to work, Carelessness of the nurse, Lack of Awareness of drugs, Lack of enough time, Novice nurse, Illegible drug cards, Lack of training classes, High load of patients (Shohani & Tavan, 2018, p.2). Of the 9 in this study, the top three were nurses’ carelessness, occupational fatigue, and illegible medication orders (Shohani & Tavan, 2018, p.2).

The second study was a quantitative descriptive-exploratory study that retrospectively analyzed spreadsheets and medication error notifications provided by nurses of university hospitals in Sao Paulo state from 2007 to 2013, in order to characterize what causes medication errors (Vilela & Jerico, 2015, p.119). Between 2007 and 2013, there was an average of 2,393 medication errors per year that were analyzed (Vilela & Jerico, 2015, p.120). There were many personal factors contributing to the occurrence of errors, such as inattention and other associated factors, followed by not checking the identification bracelet, and then issues with the medical prescription. The most frequent type of error found in this study was “omission” (31.2%) (Vilela & Jerico, 2015, p.124). Omission errors are caused by errors, such as, lapses, “forgetfulness”, and lack of attention (Vilela & Jerico, 2015, p.124). Inattention in medication administration leads to omission of any or all of the 5 rights of administration. With the factors that have been
recognized for cause medication errors, the next step is to acknowledge and implement ways to intervene and prevent such errors from occurring.

**Interventions Being Used to Reduce Medication Errors**

Medication errors are a prevalent issue in today’s healthcare. With that being said, it is necessary to go forth in our research and start discovering what interventions are being studied to eliminate the issue of medication errors. The following studies involve interventions with technology, simulations involving a medication educator, and a multiple situation simulation used to identify errors.

The first study was an integrative review of 20 international articles that identified 11 existing technologies being used to promote patient safety in the medication process (Costa et al., 2017). The top four technologies that were investigated were Radio Frequency Identification (5, 25%), Computerized Physician Order Entry (3, 15%), Bar Code Assisted Medication Administration (3, 15%), and Electronic Medication Administration Record (2, 10%) (Costa et al., 2017). The Radio Frequency Identification tool was shown as a crucial tool in the “patient identification process” and reduced errors related to changes in medication (Costa et al., 2017). The Bar Code Assisted Medication Administration and the Electronic Medication Administration Record used bar code readers to identify patient and drug being administered and reduced errors by up to 80% (Costa et al., 2017). The Computerized Physician Order Entry reduced errors by 20% due to illegibility and use of inappropriate abbreviations and lack of information (Costa et al., 2017). Although these information technologies have been shown to promote patient safety and improve quality of care by reducing errors, they are still considered hard technologies. Thus, there is concern regarding operation, possible malfunction, and lack of knowledge regarding the use of the technology (Costa et al., 2017). Overall, the technologies investigated showed that the
use of information technology and their implementation will promote patient safety by reducing occurrence of medication errors, through the process of getting a prescription to administering the medication.

The second study was a descriptive exploratory qualitative study that was developed using 4 clinical simulation scenarios using high fidelity simulators that focused on select medication problems in nursing practice guided by a pharmacy educator. This study involved 69 senior undergraduate nursing student from Belmont University in Tennessee (Marvanova & Henkel, 2018, p.163). According to the study, “clinical nurses spend as much as 40% of their time administering medications” (Marvanova & Henkel, 2018, p. 163). The 5 preventable medication errors that were demonstrated throughout the four simulations were as follows: food-drug interaction, drug-allergy interaction, incorrect drug administration, incorrect route of medication, administration of a clouded intravenous infusion with precipitate (Marvanova & Henkel, 2018, p. 164). During evaluation, over 80% of the students agreed that “the simulations were useful, accurate, and challenged them to think critically about medication errors” and over two thirds of the students reported “self-perceived benefits for the delivery of safe patient care” (Maranova & Henkel, 2018, p.167). Simulations such as this one are used to help educated and improve confidence of the student, use critical thinking as if they are in the real-life scenario, and use decision making skills that will help promote safe practice.

The third study was a quantitative Cross-sectional descriptive study that focused on a 30 situation-simulation on a 500-bed mother/child floor in a university hospital in Montreal Canada (Daupin, et al., 2016, p. 907). The results were produced based off anonymous response grids and satisfaction surveys. The aim of this study was to improve the awareness and identification of risks related to medication errors. Using a 30-situation simulation, with an error in each
situation, based off of the response grids, the overall rate of correct identification was 67.5% ± 13.3% (Daupin, et al., 2016, p. 909). Even though, the ability to correct errors is easier in a simulation, the skill of identification is still achievable with this experience. There were specific situations that had noticeable lower correct detection rate and those involved included, “administering a medication to the wrong patient, using an injection syringe for the administration of oral liquids, or forgetting to wash one’s hands before drug preparations” (Daupin, et al., 2016, p. 912). This type of simulation helped those involved to identify errors and be able to refresh memory of providing safe and efficient patient care.

Discussion:

Moving Forward

Medication errors are becoming one of the deadliest factors involved in our healthcare. After reviewing the literature, the causes have been made clear. Whether it is insufficient knowledge regarding what a medication error is and how they occur, lack of communication and reporting, or nurse related factors, such as, carelessness, omission, and lack of awareness; the cause can be prevented. There is current literature on interventions being studied, such as, the use of informative technology and simulations. However, there is a lack of consistent improvement when it comes to reducing medication administration errors. Moving forward, the quality improvement intervention that I would like to propose is a tool that will assure the nurse goes through every single one of the 5 rights of medication administration.
Part B: Quality Improvement Tool Proposal

The five rights of medication administration are a standard that is not only taught in nursing school, but it is a standard set to be used in everyday practice as a surefire way to avoid medication administration errors. Nurses and health care professionals are held to this standard, however, according to the Institute for Safe Medical Practices, “Simply holding health care practitioners accountable for giving the right drug to the right patient in the right does by the right route at the right time fails miserably to ensure medication safety” (Institute for Safe Medical Practices [ISMP], 2007). When the nurse is held solely accountable to hold up the five rights, there is a failure in acknowledging any system weaknesses and human factors that may contribute to medication administration errors (ISMP, 2007).

According to an ISMP alert, “We ‘see’ with both our eyes and our mind. While our eyes, with proper eyesight, have the capacity to take in all information, our mind learns to screen out information that it considers less useful to prevent information overload. Additionally, as we gain experience, we develop a picture in our mind of items in our environment. Thus, as we attempt to locate or recognize items through comparison with our mind’s picture, we are often unable to see any disconfirming evidence if the wrong product is selected” (Hospital Quality Institute, 2014). Human errors occur when the system doesn’t have a specific path or guideline to follow because it leads to a huge window of interpretation as to “how” to establish the five rights of medication administration, thus creating room for medication error (Hospital Quality Institute, 2014). A failsafe way needs to be designed that maintains and properly follows the five rights of medication administration in order to prevent errors (ISMP, 2007). Currently the interventions in place still produce error. For example, the Computer Assisted Bar-code Medication Administration produces error by incorrect barcoding, which leads to a way built in for the nurse
to override the error and click through the administration without even noting any errors in the five rights, thus leaving medications to not getting scanned in properly (See Appendix A for reasons why medications aren’t scanned properly with barcoding).

The hypothesis I propose is: If *nursing students/nurses* use a **developed tool targeting and walking through of all 5 rights of medication administration**, step by step, there will be a decrease in medication errors.

**Methodology:**

**Tool Design**

Keeping in mind the human factors contributing to medication administration errors, the tool that I have designed takes the health care professional through a visual step by step process that eliminates the typical unfocused scanning and clicking, thus preventing them from missing an error, such as wrong patient, wrong dose, wrong drug, wrong route, or wrong time. This tool runs through each of the five rights, step by step. As you go through each step, you must compare to the MAR. Ideally, this tool will be merged into the MAR and automatically compare with the MAR, so if one of the criteria inputted doesn’t match, you will be flagged and not allowed to continue until the error identified is corrected. As far as accessibility, the layout of this tool runs through various fill in boxes, check boxes, and drop downs, that are easy and time efficient to complete. Please refer to the appendix for the layout of this tool (See Appendix B).

Beginning with “right patient”, the tool provides an area for you to fill in the two patient identifiers, first and last name and date of birth. These boxes are specifically fill in by typing in the patient name and birthday, in order to avoid common errors that come with scanning a wrong barcode on the wrong patient. After you fill it in, check against the MAR, and if that is the right patient, check the box and hit continue.
After verifying “right patient”, you are then prompted to the patient’s administration home screen where you can add a new drug to be administered and view any drugs already inputted for this administration. When you click add new drug, you will be brought to the Drug Administration screen, where you verify the “right drug” by selecting the drug that you are administering, rather than selecting a drug pre-inputted in the MAR. If the drug you have and select doesn’t match up, it would be flagged, and you would be stopped. If the tool isn’t merged with the MAR, you then visually compare what you inputted with the MAR to make sure it matches up. Then, there are two check boxes, do you understand the drug’s side effects/interaction, and did you educate the patient. These two check boxes are an extra step that further verifies not only your understanding but allows for patient understanding and autonomy in their care.

The next step is Dose Administration, where you verify “right dose”. After you fill in the dose and unit that you are administering, you verify it against the MAR checking that the dose you have matches the prescription. Once again, if it was an automated system that is connected to the MAR, an incorrect dose would be flagged, and you would be stopped.

After Dose Administration is Route Administration, where you verify “right route”. You check the route you are using and location. If you select IV, you’d run through extra check boxes verifying line checks, fluid compatibility, and saline flushes. If you select Oral, you’d verify with a check box that the patient is able to swallow. If the route matches up with the prescription, you can finally submit the drug for administration. You will then be brought to the patient’s administration home screen, where you can view all the drugs ready for administration.

If all the drugs you are giving are inputted and, on the screen, then you are ready to finish administration, which brings you to the screen where you verify “right time”. You select
the time and verify it against the MAR. If it is not the correct time for all drugs, a pop up will come up, where you can put a reason for a delayed or as needed (prn) time. Once the time is verified, you can submit and give the medications.

A final screen will pop up saying you are cleared and offer you the ability to download a report. If it is integrated into the MAR, it will automatically be entered in and you can access the report at any time. Having the ability to download the report allows for it to be printed out and given to the patient, once again further involving the patient in their care.

**Discussion:**

**Barriers Considered**

Some barriers to the success of this tool considered in development they are the nurse’s ability to override and the time-consuming aspect of this type of tool. Overriding allows for steps to be skipped and rights to be falsely verified, which can lead to errors. In order to avoid overriding being an issue with this tool, if there is an error flagged and you need to in surpass it, you must have a charge nurse’s signature. Having the charge nurse sign is promised verification that the reason for overriding is legitimate and not causing a medication error. The tool being time-consuming is another possible barrier to its success. If the tool consumes a lot of time, there will be a decrease in motivation for its use and increase possibility of workarounds that may lead to medication errors. In order to assure that the tool is time efficient, I used dropdowns, check boxes, and minimal fill in boxes in the layout. To run through the program, is designed to be on average 1-2 minutes for one medication plus 30 seconds-1 minute for every additional medication. It may be faster or slower depending on any complications/flags or patient questions that may arise.

**Limitations**
A limitation to this tool is that since it is newly developed there is no documented research of its use, efficiency, and effective in real life practice, thus leaving no evidence that it will be an effective intervention in eliminating medication errors. When addressing this limitation in the future, I would conduct both a quantitative and qualitative analysis of its use. Quantitatively I would look at its effectiveness in overall decreasing medication errors from occurring. Qualitatively, I would look at the nurse’s overall review of the tool, its accessibility, and efficiency.

**Moving Forward**

There is a lot of promise with where this tool can go. It can either be adapted as a training tool or it can be used in real life practice. For training purposes, it can be brought into both the simulation and clinical setting. The student can use the tool as a guide and way to learn and develop skills of safe medication administration utilizing the five rights of medication administration. In real life, this tool can be integrated in the Electric Medical Record as part of the Medication Administration Record. This tool can be used in place of or in addition to barcode scanning as the tool to help guide nurses through safe medication administration utilizing the 5 rights of medication administration.
References


**Appendix A: Errors in Barcoding**

<table>
<thead>
<tr>
<th>Table 1. Most Frequent Reason Why Medications Not Scanned Prior to Administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No bar code on dose</td>
</tr>
<tr>
<td>a. Split dose</td>
</tr>
<tr>
<td>b. Liquid medication in syringe</td>
</tr>
<tr>
<td>c. Bar code on outer box/wrapper discarded with first use (ointment, eye drops, inhalers)</td>
</tr>
<tr>
<td>d. Patient's own medication; no bar code</td>
</tr>
<tr>
<td>2. Bar code damaged</td>
</tr>
<tr>
<td>a. Bar code torn when unit dose peeled open</td>
</tr>
<tr>
<td>b. Bar code on ointment “crimped” with successive administrations</td>
</tr>
<tr>
<td>3. Bar code hard to read with the scanner</td>
</tr>
<tr>
<td>4. To avoid system default to the next scheduled dose when the current dose is being administered beyond the acceptable time frame set in the bar coding system</td>
</tr>
<tr>
<td>5. Patient off nursing unit; bar code administration system not available</td>
</tr>
<tr>
<td>6. Patient registration not complete; emergency medication needed</td>
</tr>
</tbody>
</table>

(Hospital Quality Institute, 2014)
Appendix B: Tool Layout

Step 1: Patient Identification – Is this the Right Patient?

Step 2: Add Drug

Step 3: Drug Administration - Is this the Right Drug?
Step 4: Dose Administration - Is this the Right Dose?

Step 5: Route Administration - Is this the Right Route?
Step 6: Option to View All Drugs and Add Another Drug (Repeat Steps 3-5)
Step 7: Time Administration - Is this the Right Time?

Step 8: Administration Complete (Option Available for Documentation into system):