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Strategies for Reducing Medication Errors in an Outpatient Internal Medicine Clinic.

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
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Abstract

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MS, Walden University, 2016

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Project Submitted in Partial Fulfillment

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Abstract

Medication errors remain one of the most common causes of unintended harm to patients and have led to many deaths. Some categories of medication errors include; medications administered to the wrong person; medications administered at the wrong time, through the wrong route; administration of the wrong medication and/or dose; and the omission of medications. Guided by the logic model, the just culture model and the Knowles theory of andragogy, the purpose of the project was to determine if providing information related to evidence-based strategies to reduce medication errors will result in safer medication administration practices and improved patient outcomes. A pre-knowledge survey was administered to determine the competency of the participants (11 staff members), evidence-based information on strategies to reduce medication errors was then presented with the participants giving return demonstrations of key points. Immediately after the educational session, a post knowledge survey was conducted to determine retention of knowledge. There was an increase in the percent of correct responses to the survey after the educational session, which suggests that an educational in-service has a positive effect in reducing medication errors in an out-patient internal medicine clinic. Improving clinic staff's knowledge and behaviors regarding medication administration has the potential to decrease medication errors, improve patient safety and improve health outcomes.

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Dedication

I dedicate this dissertation to God, the almighty father and to my loving mother who went through difficulties and deprivations to see my brothers and I become very productive members of the society.

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I would like to thank the members of my committee: Dr. Eileen Fowles, Dr. Cheryl Holly, and Dr. Mary Martin for their time and excellent job done reviewing my papers. Special thanks to Dr. Fowles, the chair of my committee for her availability and commitment to seeing me complete this work. Dr. Fowles made herself very accessible and readily provided the necessary guidance to navigate this journey. For this I am ever so grateful.

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Section 1: Nature of the Project

Introduction

The National Coordinating Council for Medication Error Reporting and Prevention (2014) refers to medication error as any event that brings about inappropriate medication use or that causes harm to a patient at a time when the medication is wholly controlled by a healthcare personnel, patient or family. Medication error remains one of the most common causes of unintended harm to patients (Creed, 2017). Furthermore, the harm caused by medication errors are sometimes serious and have led to the death of some patients (Creed, 2017). The Institute of Safe Medication Practice ([ISMP]; 2013) estimated that in 2011, there were 30,725 deaths associated with medication errors, and that in 2012, despite the awareness and efforts expended to decrease medication errors, there was an almost 50% (45,421) increase in deaths related to medication errors. As high as these numbers are, they pale when compared with the estimates from the Institute of Medicine (IOM) landmark report, *To Err is Human*, which noted that up to 98,000 people die each year due to medical errors (Kohn, Corrigan, & Donaldson, 1999). The true number of medication errors, however, may not have been correctly estimated as many go unreported (Soydemir, Intepeler, & Mert, 2016).

Medication error has been acknowledged across health care disciplines, but there is no agreement among the disciplines on how best to address and correct this growing and costly challenge (Katz, Navon, Navy, & Stern, 2005). Preventable medication errors affect more than 7 million patients with associated costs of almost $21 billion yearly across all care settings (Da Silva & Krishnamurthy, 2016). The total cost of medication

errors measured in terms of lost income, disability, lost productivity and the cost of maintaining health is greater still. This is a critical issue that needs a solution. Reporting medication errors and near misses will help address this problem, as trends and patterns could be identified, and root causes discovered (Scott & Henneman, 2017). However,reporting is limited due to the fear of consequences from reporting a medical error which is the most commonly identified contributing factor to error underreporting (Kagan & Barnoy, 2013). Developing a staff educational program to highlight some strategies that could be employed to reduce medication errors and associated inherent costs and suffering has the potential to positively affect social change.

Problem Statement

The findings of the IOM study reported on the number of deaths and health complications caused by medication errors (Kohn, Corrigan, & Donaldson, 1999). The results of the IOM's study clearly defined the scope of the problem with facts and figures, making it very understandable to the general public. More recent reports indicate that preventable medical errors continue to persist as the third cause of death in the United States responsible for more than 400,000 deaths each year (Stefanacci & Riddle, 2016). Even with heightened awareness, medication errors are still common place (Thornton, 2016). Due to the prevalence and seriousness of medication errors, the need to find strategies to drastically reduce these errors cannot be over emphasized.

Even in the best of circumstances, errors will still occur due to the chain of events needed for medication administration, including the activities of the prescribing physician, the dispensing pharmacist and the administering and monitoring nurse

(Mansur, James & Edgley, 2012). However, identification of the failures that lead to mistakes and correcting them is the best way to prevent future errors from occurring (Stefanacci & Riddle, 2016). The frequency of medication error occurrence can be significantly reduced through education of all those in the chain of medication use (Kavanagh, 2017).

The emphasis in this doctoral study is on the administering and monitoring nursing staff. Medication administration is a high-risk nursing skill estimated to occupy up to 40% of floor-nurses' time (Westbrook et al, 2013). This high level of medication administration can lead to errors and serious outcomes for the patient and the involved nurse's career (Cloete, 2015). It is of great importance, therefore, that factors contributing to errors are discovered and appropriately dealt with to ensure the safety of patients and reduce the threats to a nurse's career. It is very important also that a culture of safety is maintained in all healthcare facilities to enable the investigation of errors, implementation of solutions and learning from incidents in order to reduce future risks and promote high quality patient care (Kavanagh, 2017).

The outcome of this project has the potential to influence nursing practice by explaining medication errors and increasing staff awareness about best evidence-based strategies to drastically reduce their occurrence and ensure better patient care and safety. Providing such an outline and format for an educational program can assist the nursing staff of an urban family practice in their efforts to reduce medication error and maintain the safety of their patients.

Purpose of the Study

The purpose of this Doctorate of Nursing Practice (DNP) capstone project was to provide relevant information using evidence-based strategies to reduce medication errors, including how to provide healthcare facilities with plans to encourage medication error and near-miss reporting without the fear of consequences. The project involved testing the knowledge of the clinic staff on medication errors before educational intervention, presenting relevant literature or educational material on medication errors, return demonstration of learned information and retesting. The meaningful gap-in-practice addressed by this doctoral project was the lack of sufficient education on strategies to decrease medication errors.

The guiding practice-focused question for this doctoral project was, "Will a staff education program improve staff knowledge about effective strategies for preventing medication errors?"

This doctoral project has the potential to address the lack of sufficient knowledge on strategies to reduce medication errors by conventional didactic teaching methods reinforced with return demonstrations. The return demonstrations are very necessary as according to Bogner (2009), the health care provider is likely to forget critical elements in provided education if conventional didactic teaching methods alone are used. Using repetitions through return demonstrations provides the staff member with the opportunity to develop skills proficiency.

Nature of the Doctoral Project

Medication administration errors are a persistent and recurrent problem and a significant cause of harm to patients (Keers, Williams, Cooke, & Ashcroft, 2013). To manage this problem, efforts should be geared towards seeking ways to reduce the errors as much as possible because they can never be completely eliminated and expecting an error-free performance is not realistic (Dennison, 2007). This project involved designing an educational program to in-service the staff of an urban family/internal medicine clinic on evidence-based strategies to reduce medication errors in the targeted medical facility. To achieve the purpose of this educational initiative, a comprehensive search of several peer-reviewed journals and course books was used for information retrieval about effective strategies for reducing medication errors. Several databases including CINAHL Plus with Full Text, Nursing and Health databases, Medline with full text and Ovid Nursing Journals Full Text, ProQuest databases, among others, were accessed for relevant evidence-based strategies to reduce to the barest minimum, the incidence of medication errors. Also, I developed a knowledge survey to assess staff knowledge of effective strategies for reducing medication error to be completed by the staff after the educational session. Through education and practice, the nurses were able to acquire expertise on medication administration and reduce the occurrence of errors while doing that. While medication incidents have been recognized as a common preventable cause of patient injury, reducing medication errors is an ongoing process of quality improvement and is of great importance to the nursing profession.

This staff education project was aimed at the medical and nursing staff of an internal medicine clinic, totaling 11 persons. Educational materials, based on information from the literature review, were developed and presented to the clinic's administration and staff for their review and feedback. The educational material was then adapted based on the stakeholder feedback.

The approach that was used to organize and analyze gathered evidence started with the use of the Johns Hopkins Nursing Evidence Based Practice (JHNEBP) Research Evidence Appraisal tool to determine the strength of the evidence, study results, and conclusions of relevant evidence-based research articles. The majority of the research articles fell into evidence levels III and IV ratings, as they were good quality and mainly nonexperimental studies. The competency of staff, post in-service, was assessed by comparing the results from the knowledge surveys pre- and post-presentation of educational intervention. Participating staff gave a return demonstration after the in-service. The return demonstration was necessary because healthcare providers are more likely to forget critical elements of conventional didactic teaching if there is no opportunity for practice and repetition of learned skill (Bogner, 2009).

Due to the nature of their job, nurses are directly and consistently involved in the administration phase of medication delivery (Harding & Petrich, 2008). Lehman, Conner, and Cox (2004) found that nurses spend approximately 40% of their time administering medication to patients at health care facilities and thus nurses are involved in, and report, the highest number of medication error incidents. Medication administration error, therefore, is a risk area in nursing practice (Williams, 2007). Since

medication errors are nurse sensitive indicators, the need to identify ways to effectively address the issue of medication errors and reduce them to the barest minimum cannot be overemphasized. This doctoral project provides evidence-based training on how best to minimize medication errors.

Significance to Practice

Stakeholders that may be potentially impacted by addressing the issue of medication errors include the medical director, nurse practitioners, registered nurses, medical assistants, medical students and nurse practitioner students. Providing necessary information and encouraging teamwork and collaboration among healthcare providers are important factors in providing a supportive practice environment. Nurses, according to Liang, Dickson, Xie, and Suh (2012), are more likely to be at the forefront in medication-error minimizing practices if they are placed in a supportive practice environment. With the rising need for evidence-based practice, the results of the project is envisaged to significantly contribute to nursing practice in providing evidence-based information that guides nurses to effectively administer medications with minimum errors at the project site, with the potential to generalize results to different health care centers including large urban hospitals, nursing homes, and skilled nursing facilities.

Medication errors have been recognized as a major cause of patient harm in healthcare services (Kavanagh, 2017). In addition to the deaths caused by medication errors, they are also estimated to be responsible for well over 10,000 complications and injuries everyday resulting in costs of more than 1 trillion dollars yearly (Cloete, 2015). Preventing medication errors ensures patient safety, decreases morbidity and mortality,

helps with quick recovery, decreases lengths of stay, and reduces costs involved in escalation of care and litigations (Nute, 2014). This project has the potential to contribute to positive social change by improving staff awareness of strategies for reducing medication errors. Subsequently, reducing medication errors can help patients stay healthier and ultimately result in improved health and wellbeing of the general populace (Kavanagh, 2017).

Summary

Medication errors occur at an alarming rate in healthcare facilities, both big and small, and the human and financial costs of these errors are significant. Of the several components of medication delivery, including prescribing, dispensing, administration, and evaluation, nurses are more involved in the administration phase and therefore well positioned to prevent medication errors reaching the patients (Harding & Petrick, 2008). The development of an educational in-service to raise awareness on strategies to reduce medication errors will bring about actionable practices that can reduce medication errors significantly. In Section 2, I presented a theoretical model to guide this educational in-service on strategies to reduce medication errors, providing a more detailed background.

Section 2: Background and Context

Introduction

Medication error is a patient safety matter that must be addressed in all health care settings. Implementing educational measures to validate competency within the context of a no blame culture will enable health care facilities to reduce the incidence of medication errors. The purpose of this DNP capstone project was to provide relevant information related to evidence-based strategies to reduce medication errors, including how to provide healthcare facilities with plans to encourage medication error and near misses reporting without the fear of consequences. The project involved assessing the knowledge of the clinic staff on medication errors before educational intervention, presenting relevant literature or educational material on medication errors, return demonstration of learned information, and retesting.

In this section, I address the theoretical models that guided this project, the incidence of medication errors in healthcare, and different approaches to assessing the staff knowledge and awareness regarding most recent evidence-based strategies to prevent medication errors. The following practice-related questions guided this staff in-service educational project.

- What is the appropriate evidence-based content to include in an in-service educational program aimed at decreasing the incidence medication errors in healthcare facilities?
- What are nurses' knowledge scores regarding strategies to minimize medication error pre- and post- an educational in-service session?

- What is the effect of an educational program on nurses' administration of medication during a return demonstration?
- What challenges are there to reporting medication errors?
- What opportunities or challenges could influence the implementation of this educational project?

Concepts, Models and Theories

Nurse staff education assists nurses in gaining or improving knowledge, skills and critical thinking ability necessary to improve patient outcomes (McHugh & Lake, 2010). The logic model, the just culture model, and Knowles adult learning theory guided the realization of the goals of this staff educational in-service project. Advanced practice nurses may educate their patients using any combination of theories and models to achieve best results (Syx, 2008). The logic model was used to guide the development of a plan for implementing the educational program (Hodges & Videto, 2011), at the internal medicine clinic in suburban Detroit, Michigan. The just culture model was used for creating and supporting a learning culture that is open and fair, and focused on creating safer systems and managing behavioral choices (Barnsteiner & Disch, 2012).). The adult learning theory by Knowles, which is based on the premise that adults require certain considerations to effectively learn (Knowles, 1984), was used to demonstrate how using the adult's experience, orientation to learning, and intrinsic satisfaction can aid in avoiding medication errors. Elements of each model or theory and how they apply to this project will be further discussed.

The framework of the logic model, which promotes change, was used to evaluate the effectiveness of the project, especially the extent of new knowledge on adherence to presented strategies on avoiding medication errors. The logic model shows the relationships among the inputs and resources available to create and deliver an intervention, the activities offered by the intervention, and the expected results (Hodges & Videto, 2011). The logic model was also used to identify the intermediate and ultimate outcomes of the intervention, and the pathways through which intervention activities produce those outcomes (Hodges & Videto, 2011).

Logic models can serve as a guide for the development of measures of critical intervention inputs, processes and outcomes. It serves as a road map for data collection and can assist evaluators to identify the questions to be answered to, in turn, guide evaluation priorities and allocation of resources (Hodges & Videto, 2011). As the program began, the goals and objectives were reviewed with the logic model as a guide. According to Hodges and Videto (2011), a logic model can help intervention planners reach consensus about their goals and objectives and uncover any gaps in the intervention logic. The logic model is expected to provide a framework to identify areas in the program that need refinement, midcourse corrections that need to be done and any technical assistance to support ongoing implementation (Hodges & Videto, 2011). I used this model to monitor operations and track how the intervention evolved over time (see Table 1). Tracking indicators for each step in the logic model helped determine whether resources were sufficient and whether activities were being implemented according to plan.

Table 1

Logic Model Evaluation of Clinic Staff for Project Effectiveness

Inputs	Activities	Outputs	Outcomes
Funding provided by clinic management	Supply of materials needed for in-service (room, PowerPoint machine, desks, tables)	Conference hall ready for in-service education session	In-service held
Pre-Knowledge survey	Pre-test administered	Answers obtained	Results noted
Instructor (DNP student)	In-service training provided	100% participation by approved clinic staff	Staff become more aware of strategies to avoid medication errors
Post knowledge survey	Post-test administered	Answers obtained	Results noted

A just culture environment is essential to help provide psychological comfort and safety and encourage discussions about medication errors (Dennison, 2007). According to Barnsteiner and Disch (2012), healthcare has typically had a punitive approach to errors that occur especially in relation to medications and this has led to very few reporting of errors. Fear of consequences if a medical error is reported is identified commonly as a contributing factor to error underreporting (Almutary, & Lewis, 2012). When errors occur, and they are not reported, there is no opportunity to learn from the errors, so they will continue to be made and hidden, while the patients bear the brunt as a result. A just culture was described by Barnsteiner and Disch (2012) as one that is transparent, without fear of retribution if a medication error is made and rewards people who report safety-

related information so that efforts can be made to improve and fix the system. Emphasis on "what" went wrong and not "who" did it is critical to achieving success in medication errors containment (Barnsteiner & Disch, 2012). In healthcare, the standard of practice in medicine and nursing has been perfection, however, healthcare professionals agree that mistakes are inevitable and most want to learn from their mistakes in an understanding and supportive environment (Leape, 1994). The just culture is about supporting a learning culture, that is open and fair and focused on designing safer systems and managing behavioral choices (Dennison, 2007).

According to Parry, Barriball and While (2015), some behaviors that contribute to error include genuine human error or slip in judgement, at-risk behavior - where the healthcare provider makes a conscious and intentional choice to engage in the risk behavior and reckless behavior, in which there is a conscious disregard of rules and processes or acceptance of an unreasonable amount of risk. The first type of behavior can be managed through training and changes in procedure. Here the person that made the mistake is supported and consoled just as the "just culture" would demand. The second situation where the provider drifts from following policies and procedures, the behavior is managed through removing incentives for at-risk behaviors, creating incentives for healthy behaviors and increasing situational awareness (Parry, Barriball & While, 2015). The reckless behavior is managed through remedial or punitive action. One event however should not warrant any disciplinary action or termination, unless a pattern or history exists of medication errors or there is evidence of reckless behavior. It is not

realistic to expect a perfect or error-free performance in healthcare. Errors do occur despite having system defenses and safeguards in place to avoid them.

A just culture environment is a necessity for the provision of psychological safety and decreased fear or anxiety in talking about medication errors. Nurses are more likely to report errors and near misses when they know it is safe to report and their career is not in any danger. When systems issues and processes are identified, management has the responsibility to address them by committing personnel and resources to build better and safer systems geared towards improving the quality and safety of patient care (Choo, Hutchingson, & Bucknall, 2010). The just culture abhors disregard to patient safety or misconducts such as falsification of medical records or performing duties while impaired. Implementation of this model therefore, will encourage and enable the healthcare provider report medication errors without the fear of being punished (Marx, 2007).

The theory incorporated in the educational in-service program is the Knowles theory of andragogy. Considering that the educational in-service is for the staff of the clinic who are adults, this theory stands quite appropriate and applicable here. Knowles introduced the concept of andragogy, a learning philosophy that distinguishes the ways in which adults learn from the ways in which children learn. He noted that in adult education, instructional design centers on the learners' needs and interests (Knowles, 1989). The practice of adult learning introduces a new, qualitative approach and optimizes innovative motivation for learning (Knowles, 1990). Knowles (1984) stated that adults need to know why they must learn something before they start, and they want to be perceived as self-directed. The life experiences of adult play very significant roles

in learning as they constitute a rich resource that can be tapped into (Knowles, 1989). Adults need individualization of learning strategies and require internal motivators much more than external motivators. The learning has to be centered on life and tasks and there must be an opportunity to function autonomously (Knowles, 1990). The research done by Knowles set the foundation for the adult learner in any setting, with consideration to how life experience changes an individual's expectations in a learning environment.

Knowles' theoretical work has been used by adult educators as an instrument that distinguishes the field of adult education from other areas of education (Merriam, Caffarella, & Baumgartner, 2007)). The theorist's learning assumptions were considered while designing the research instruments, and throughout the study. The approach focuses on six learning assumptions that are applicable to the adult learner and his/her life situations. These are: (a) self-concept, (b) experience, (c) readiness, (d) orientation, (e) motivation, and (f) relevance (Knowles, 1980). Knowles lists these six assumptions with the understanding that adults will have more experiences than children will and have created pre-established beliefs (Taylor & Kroth, 2009). Experience is very important here as adults are focusing more on the process rather than the content being taught (Taylor & Kroth, 2009). In adult education classes, students' experiences count for as much as the facilitator's knowledge (Knowles, 1989). Further, the theorist formulated the learning assumptions as foundational to designing programs for adults, and from each of the assumptions drew numerous implications for the design, application, and assessment of learning activities with adults (Merriam et al., 2007). Once adults discover that they can

take responsibility for their own learning they experience a sense of release and exhilaration and go into learning with deep ego involvement (Knowles, 1980).

The adult learning theory presents a challenge to stagnant perceptions of intelligence, standardized restrictions of orthodox education, and theory, which set limitations in learning environments (Knowles, 1989). The model emphasizes the immersion of adult learners in a process of self-evaluation of learning (Knowles, 1984). The theory is appropriate for this proposed study because it focuses on the specific characteristics of adult learners, depicting how they learn, their perspectives toward learning, and their motivation for learning. From the working experiences of the staff, they are aware that medication errors occur frequently and are common place (Syx, 2008), and will be very willing to learn new evidence-based strategies to minimize them. This was therefore considered in preparation for the educational in-service provided.

Relevance to Nursing Practice

According to The Joint Commission (2016), medication errors are of a crucial concern to health care organizations. Medication errors can be caused by any of the members of a health care team, however, nurses report the highest number of these incidents. Medication Administration error is one risk area in nursing practice and occurs when there is discrepancy between medication received by patient and that prescribed by provider (Williams, 2007). Advanced practice nurses must assist other nurses create a culture of patient safety with medication administration. Patient medication administration is a nursing domain which requires strict and undivided nursing attention during its implementation. Protocols and steps should be taken to ensure patient safety

when delivering a patient's medication regimen. Medication administration among nurses is an intervention which carries a high risk of error (Bush et al., 2015). With an increase in the number of drugs available, nurses may experience unfamiliarity with certain medications, inadequacies in math calculations, stressors in the everyday environment, and lack of pertinent information about the patient and potential equipment problems. These are some of the issues nurses face when administering medications and therefore require appropriate education to arm themselves with enough information to mitigate against the errors.

Advanced practice nurses have the professional obligation to advocate and facilitate the utilization of evidence-based strategies to minimize medication errors. If well implemented, this educational in-service could improve on the standard of care provided in this clinic through the minimization or reduction in the incidence of medication errors. This should increase patient/family satisfaction and faith in nursing practice as well as improve outcomes. Considering the known information that one out of every five medications administered by nurses was in error (Barker, Flynn, Pepper, Bates & Mikeal, 2002), any action that will contribute to the prevention or minimization of medication errors should be of relevance to nursing and remain a priority. Medication errors can occur anytime during the process of prescribing, transcribing, dispensing, administering or monitoring of medications (Radley et al, 2013). Advanced practice nurses (APN) are well trained to facilitate the implementation of evidence-based practices including practices deemed necessary to avoid or minimize medication errors to the barest minimum. Working in collaboration with other disciplines, APNs should

ensure the maintenance of consistent and organized patient care. This staff education in-service will help participants master evidence-based strategies that will help avoid medication errors and maintain safety and satisfaction of patients.

A supportive practice environment is a necessity in the fight against medication errors. According to Liang, Dickson, Xie & Suh (2012), nurses are more likely to be in the forefront in medication error reduction practices if they are placed in a supportive practice environment. Providing information and emphasizing the need for teamwork and collaboration with various disciplines especially between physicians and nurses is an important factor in creating a supportive environment. It is expected that the results from this project will be a significant contribution to the nursing practice by providing evidence-based information to guide nurses while handling medications to prevent medication errors.

The Medication Management Process

The gap-in-practice related to medication errors management has been addressed using different strategies. The recent utilization of health information technology (HIT) in the healthcare circle has enabled a seamless flow of information throughout the medication management system. Among the systems utilized in preventing medication errors through HIT are: the electronic health records (EHR), computerized physician order entry (CPOE), the barcode medication administration (BCMA), the automated dispensing cabinets (ADC), and the clinical decision support system (CDSS). The adoption of HIT has positively affected medication errors management, as healthcare

systems that utilize the EHR, CPOE, the BCMA, the ADC and the CDSS have shown significant reduction in medication errors (Agrawal, 2009).

In his publication, James (2013), noted that medication errors are the third leading cause of death in hospitals and nearly 98,000 of these deaths could be prevented each year. Decision making in the clinical setting is a complex process as it requires attentiveness, understanding, quick recall and synthesis of large amounts of data critical for patient care. This process of decision making has been made a lot easier as health information technology systems have improved availability and access to needed information, organized and linked them together reducing human recall time and the amount of complex data to synthesize (James, 2013). Thus, HIT has been able to bridge the gap between knowing and doing by presenting relevant information to providers during decision-making (James, 2013).

There is the need for nurses and other healthcare practitioners to be knowledgeable about the operations of the HIT systems. The use of technology in data entry and analysis will ensure efficiency, accuracy and less errors in medical care as most of the common medical errors result from wrong input and handling of patient information. Therefore, the healthcare practitioner needs to adopt quality HIT systems that operate on computerized platforms. Technology will eradicate the issue of data loss, boost the performance of data-handling methods and ensure that data are easily retrievable for future references. This is why it is both necessary and relevant that an educational in-service be held to acquaint medical staff, especially those concerned mainly with handling of medications on how technology can help prevent medication

errors. This project provides information on various strategies to minimize medication errors, including effective use of HIT, implementation of the five Rs of medication administration (right medication, right route, right time, right individual, and right dosage), quick report of errors when they occur, and a positive learning climate. A positive climate in which open evaluation of the potential causes of medication errors takes place should facilitate improved learning about the errors and as a result, be associated with fewer medication errors over time (Van Dyck, Frese, Baer, & Sonnentag, 2009).

Local Background and Context

Since the publication in 1999 of the Institute of Medicine's (IOM) report "*To Err is Human: Building a Safer Health System"* much attention has been drawn to patient safety. In fact, the medical errors exposed in the report were so alarming that regulatory and legislative initiatives were scrambled to better document errors and begin the search for solutions (Kohn, Corrigan & Donaldson, 1999). The interest generated by this publication led to so many academic researches and inquires related to medication errors. Evidence of medication errors were demonstrated in all healthcare institutions including hospitals of all sorts, out-patient clinics, pediatric hospitals and nursing homes (Ghandi et al, 2000). The aftermath of the publication led to patient safety being a very crucial issue in the US healthcare system (Leape, Berwick, & Bates, 2002).

The prevalence of medication error is the most eye-catching issue in the IOM's report. According to the Harvard Medical Practice Study in 1991, adverse drug events (ADEs), defined as injuries resulting from medical interventions related to a drug, were

the single most frequent cause of all types of adverse events, accounting for 19.4% of all disabling adverse events (Bates, Boyle, Vander Vliet, Schneider, & Leape, 1995). Specifically, in 1995, Bates, et al. reported that 2 to 14% of patients experienced at least one medication error during hospitalization, which is equivalent to 0.3 errors per patient-day. Seven years later, the Institute of Medicine (2006) reported that at least one medication error occurs every day for every hospitalized patient, implying that the error rate has not abated over the preceding seven years. As stated above, in the case of medication administration errors committed by nurses, one observational study found that one of every five doses administered by nurses was in error (Barker, Flynn, Pepper, Bates, & Mikeal, 2002). Consequently, continued research to better understand factors that can contribute to the prevention of medication errors and education of the frontline healthcare staff on how to avoid or minimize their occurrence remains a priority.

While it is true that most of these errors do not result in injury, it is also true that as many as 1.5 million people annually experience harmful sequelae from a medication error (IOM, 2006). In fact, the increased risk of death associated with adverse drug events is almost twofold compared to that not associated with ADEs, and researchers have estimated adverse drug reactions (ADRs) to be responsible for more than 100,000 deaths nationwide each year (Lazarou, Pomeranz, & Corey, 1998). Incidentally, ADEs rank fifth, after congestive heart failure, breast cancer, hypertension, and pneumonia, among the leading causes of preventable threats to the health of older Americans (Fink, Siu, Brook, Park, & Solomon, 1987).

Role of the DNP Student

It is clear from literature review that a major problem in our healthcare system in terms of patient safety is medication error. As noted above, the figures are alarming, and the effects could be devastating. Medication errors cause significant harmful effects to patients and is very costly to the society (Keers, Williams, Cook, & Ashcroft, 2013). It is therefore pertinent that all efforts should be made to solve this problem. There is an abundance of literature on the causes of medication errors and many remedies have been suggested. These remedies need to be implemented and who is in a better position than the advanced practice nurse to accomplish this? DNP graduates are trained in the translation of knowledge into practice for the benefit of their patients and the society at large. By designing a staff educational in-service to disseminate strategies to reduce the occurrence of medication errors, I will be helping address the issue of medication errors and thus play a role in improving the quality of healthcare by ensuring patient safety and reducing the costs associated with medication errors.

Summary

Nurses, by virtue of their trade make the most medication errors (Tzeng, Yin & Schneider, 2013). Medication errors are a present and major problem affecting patients' safety. The problem of medication errors is being tackled from many fronts including the use of health information technology such as the electronic health records (EHR), computerized physician order entry (CPOE), the barcode medication administration (BCMA), the automated dispensing cabinets (ADC), and the clinical decision support system (CDSS). The purpose of this practice improvement project is to use an

educational in-service training to acquaint the staff of a local clinic on strategies to reduce to the barest minimum the incidence of medication errors.

In this section, I used the logic model which is a good process model and the just model to provide some grounding in the tone of this educational session. Also utilized was the Knowles theory of adult learning which provides a basis for the educational interaction that will go on between me as a staff educator and the nursing staff at the clinic.

Section 3: Collection and Analysis of Evidence

Introduction

In most cases, healthcare practitioners do not intend to commit medication errors. The training of healthcare providers emphasizes error-free care, and despite all efforts, mistakes still occur. Knowing this, efforts should be made to reduce the occurrence of medication errors to the barest minimum. Estimates from past research suggest that hospitalized patients are subjected to at least one medication error per day (Aspen, et al, 2007). When mistakes happen, the healthcare providers experience a complex of emotional responses, including devastation, embarrassment, and desire to conceal the mistake, shifting blame, and resistance to implicate other providers (Wolf & Hughes, 2008). The purpose of this DNP capstone project is to provide relevant information related to evidence-based strategies to reduce medication errors, including how to provide healthcare facilities with plans to encourage medication error and near misses reporting without the fear of consequences from the management or employer. The project will involve testing the knowledge of the clinic staff on medication errors before educational intervention, presenting relevant literature or educational material on medication errors, return demonstration of learned information, and retesting.

Practice-focused Question(s)

In this section, I address the practice-focused questions, sources of evidence and how they were obtained, and the approach used to organize and analyze the evidence. The guiding practice-focused question for this doctoral project is, “Will a staff education

program improve staff knowledge about effective strategies for preventing medication errors?"

This doctoral project has the potential to increase nurses' knowledge on strategies to reduce medication errors by conventional didactic teaching methods reinforced with return demonstrations. The return demonstrations are very necessary, as according to Bogner (2009), the health care provider is likely to forget critical elements in provided education if conventional didactic teaching methods alone are used. Using repetitions through return demonstrations provides the staff member with the opportunity to develop skills proficiency.

The following questions guided the educational in-service:

- What is the appropriate evidence-based content to include in an in-service educational program aimed at decreasing the incidence medication errors in healthcare facilities?
- What are nurses' knowledge scores regarding strategies to minimize medication error pre- and post- an educational in-service session?
- What is the effect of an educational program on nurses' administration of medication during a return demonstration?
- What challenges are there to reporting medication errors?
- What opportunities or challenges could influence the implementation of this educational project?

The plan for this project was to design a staff educational in-service program which aligns with the practice-focused questions. The overall goal entailed designing a

plan to assess the effectiveness of an educational in-service in facilitating reduction in medication errors. The plan will include developing the content and format of an educational initiative, designing a plan to implement and evaluate the initiative in the target medical clinic, and presenting the components of the staff educational in-service initiative to the management and staff of the medical clinic for their evaluation and feedback. The meaningful gap-in-practice being addressed by this doctoral project is the lack of sufficient education on strategies to decrease medication errors.

Operational Definitions

The following keywords were used in this study:

Error: An unintended event or act. This can be something that was done or something that should have been done but wasn't (IOM, 2006).

Medication Error: The National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP), defines medication error as any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the healthcare professional, patient, or consumer (NCC MERP, 2014). Such events may be related to professional practice, healthcare products, procedures and systems, including prescribing; order communication, product labelling, and packaging; compounding; dispensing; administration; education; monitoring and use (NCC MERP, 2014).

In-service: According to the Merriam-Webster dictionary, in-service is a form of training intended for those actively engaged in the profession or activity concerned.

Adverse Drug event: Described by the U.S. Department of Veteran Affairs as harm associated with normal usage or dosage of a drug.

Health Information Technology (HIT): A general term for describing a wide array of technological products, including infrastructure, hardware, software and services, designed to enable coordination between healthcare departments and used by all healthcare teams to collect, store and exchange patient data and information in clinical practice (American Medical Association, 2014).

Sources of Evidence

Sources of evidence for the development of the in-service educational program is discussed first followed by a discussion of the sources of evidence for the staff evaluation of the educational initiative and implementation plan. To achieve the purpose of this educational initiative, a comprehensive search of several peer reviewed journals and course books was used for information retrieval about effective strategies for reducing medication errors. Several databases including CINAHL Plus with Full Text, Nursing and Health databases, Medline with full text and Ovid Nursing Journals Full Text, ProQuest databases, among others were accessed for relevant evidence-based strategies to reduce to the barest minimum, the incidence of medication errors. One source of evidence for the development of the educational program was an assessment of the clinic staff to identify educational needs in relation to medication safety and strategies to better deliver the educational content. The integrity of the information obtained was assured by conducting a critical analysis of peer-reviewed literature emphasizing evidence-based practices on medication errors prevention as well as by obtaining information from

internal and external stakeholders through a knowledge survey that was administered before the educational content was delivered. The information obtained assisted in developing the content and format for the educational initiative.

To successfully design the implementation program, it was necessary to put into consideration the space in the clinic, the staff and their readiness and willingness to participate in the initiative and policies of the clinic. I relied on many peer-reviewed articles, publications, dissertations and books as sources of evidence. I sought information about, content on best evidence-based strategies to decrease medication errors, format for presenting the content for this educational initiative and review of the clinic's policies related to providing educational programs to clients.

It has been recommended that educational programs be carried out or presented in natural settings, which are uncontrolled, real-life environments or situations (Grove, Burns, & Gray, 2013). One such natural environment located in the clinic was the conference room. The conference room was equipped with an oblong table that can sit up to 20 people, a projector screen for power-point presentations, upholstered chairs for the comfort of participants that were placed around the table, and a small podium with a microphone on an adjustable stand. This conference room was used for the educational in-service presentation.

The medical center is an out-patient internal medicine practice located north-west of Detroit, Michigan. It provides care to patients 21 years and above regardless of gender or ethnicity, focusing on primary health care services. The medical center sees an average of 30 patients daily. The patients are seen for comprehensive examinations, medication

management, infusion therapy, weight loss management and tissue rejuvenation therapy using platelet rich plasma (PRP). Most patients receive the first doses of their medications in the clinic and the intravenous infusion therapy is done to provide needed vitamins, minerals, antioxidants, amino acids and other forms of medications for faster delivery to the cells throughout the body. The different forms of medications administered in-clinic informed the decision to look into medication errors and how to reduce them. The clinic equally provides laboratory services.

To carry out this staff educational project on strategies to reduce medication errors, I developed a plan to implement a staff in-service educational program for the medical/nursing staff in the medical clinic. The project plan helped achieve set objectives. The plan involved developing an in-service program with the objectives and content related to the purpose of the program, evaluation tool as a component of the educational initiative to evaluate potential participants' knowledge regarding strategies to reduce medication errors and how those strategies are put into practice in the clinic. The return demonstration was evaluated by me through observation and matching activities in the demonstration with a hand-held checklist with points that should be addressed by the participants (Appendix A). The questions in the evaluation tool provided informal, formative information for the clinic's staff and will obtain answers to questions and concerns that the clinic stakeholders may have, all geared towards filling any loopholes in understanding how best to avoid medication errors as presented in the educational in-service.

Staff Evaluation and Educational Initiative

I developed a series of questions that will be presented to the participating staff in the clinic to assess the effectiveness of the educational program components and any issues that could influence the implementation of this educational program. The staff perceptions of the appropriateness of the contents of the in-service educational program was assessed using a Likert scale. The Likert scale is a five-point set of response options, containing a middle point balanced by positive and negative options on either side (Cooper & Johnson, 2016). The medical clinic's staff were the target sample for this evaluation of the components of this educational initiative project. According to the logic model, input from stakeholders is essential in ensuring the program success (Hodges & Videto, 2011). The Clinic has a total of 11 permanent staff members, 3 medical students usually on rotation and 1 nurse practitioner student. I am told that as one set of students finish their rotation, another set arrives to replace them, since the clinic has a standing contract with a medical school in the Caribbean for year-round rotations. The permanent staff include, the physician (Medical director), 2 nurse practitioners, 2 registered nurses (RN), 1 Licensed Practical Nurse (LPN), 1 office manager, 1 medical assistants, 1 phlebotomist and 2 receptionists. The office manager, phlebotomist and the receptionist were excluded. In order not to interrupt the proceedings of the clinic, arrangements were made with the medical director to have the presentation done during their monthly meeting session. The clinic policy regarding participation of staff in new projects was reviewed with the staff in charge to make sure I was in conformity.

As stakeholders, the participants were asked to respond to questions that will be compiled by me for the purpose of assessing knowledge about methods for avoiding medication errors before and after the educational contents were shared. The questions were designed to address the practice-focused question(s) for the project. The questions addressed the relevance of the contents of the in-service educational program to practice, and the evaluation tools and data gathering strategies to determine the effectiveness of the educational program. Staff responses to the questions were summarized and major themes identified (Hsiu & Shannon, 2015). Since the information provided in the in-service session were developed from reviews of literature, the staff perception of the relevance of the information to practice were also assessed using the Likert scale.

Protection of Human Subjects

This is a minimal risk quality improvement project as is evidenced from the project title, the educational in-service was conducted with the staff of the target clinic. The staff were made aware of the voluntary nature of the exercise, and informed that everyone will respect their decision to participate or not participate and that they have the right to withdraw from the project at any time without recourse. I assured the staff about the maintenance of their confidentiality and privacy, and protection from discomfort and/or harm. Prior to participation, the clinic staff received reliable information about the educational initiative project, background information, procedures, voluntary nature of the study, risks and benefits of being in the study.

Approval for the staff evaluation component of the educational in-service initiative was obtained from the Institutional Review Board (IRB) of Walden University

prior to project implementation. The approval number assigned by the IRB for the staff education in-service initiative was 05-17-18-0422063. The medical director of the clinic provided oversite of the project. The project included review of policies, and data obtained from literature reviews on strategies to reduce medication errors, discussion of the components of the education program, responses to posed questions addressing the accuracy of the content in the educational program, review of proposals for implementing the educational project, and evaluation tools and data gathering strategies to determine the effectiveness of the educational project. To avoid misunderstandings, and obtain staff consent, participants were asked to answer open ended questions about their understanding of the intended study.

Analysis and Synthesis

The process involved developing relevant questions to obtain some meaningful answers from the patient's own knowledge and experiences on the issue of developing a staff in-service educational program on evidence-based strategies to reduce medication errors. There were open ended questions, Likert type questions and forced choice questions. According to Farrell (2016), the most important benefit of open-ended questions is that they allow the researcher to find more information than he or she anticipates, such that people may share motivations that he/she did not expect and mention behaviors and concerns that they may not be aware existed. When people are asked open-ended questions, they often reveal surprising mental models, problem solving strategies, hopes, fears and much more (Farrell, 2016). The degree of learning and comprehension of provided education was assessed using a pre- and post-knowledge

survey. Any mistakes noted in the return demonstrations were discussed during a debriefing session and positive reinforcements or feedbacks provided. Immediately after the presentation of the in-service, a post in-service knowledge survey was conducted, the goal of which was to determine retention of information and competency of each participating staff member in safe medication administration.

The results from the analysis of the responses were compared to evidence-based literature on the effectiveness of education on reducing medication errors. I then organized the data by questions evaluating all respondents and their answers to identify common themes. Code numbers were assigned to each participant to shield their identity and their written responses will be kept in the archives of the clinic.

Below are compilations of Likert-type and open-ended questions and how each aligns with the practice-focused questions that would guide this project.

Question 1. Do you think developing an educational in-service on strategies to decrease medication errors will benefit this clinic?

a. Strongly agree
b. Agree
c. Neutral
d. Disagree
e. Strongly disagree

This aligns with practice-focused question #3.

Question 2. What other strategies or activities to reduce medication errors do you think should be included in this educational in-service? Aligns with practice-focused question #1.

Question 3. The in-service educational program will expand my awareness of what constitutes medication errors?

a. Strongly agree
b. Agree
c. Neutral
d. Disagree
e. Strongly disagree

This aligns with practice-focused question #1.

Question 4. What medication errors in your opinion are most prevalent in this clinic? Aligns with practice-focused question #1.

Question 5. How do you plan to measure the success of this project? Aligns with practice focused question #2

Question 6. What to you is the issue that deserves the most attention while dealing with medication errors? Aligns with practice-focused question 1.

Question 7. The contents of this educational in-service project are appropriate?

a. Strongly agree
b. Agree
c. Neutral
d. Disagree

e. Strongly disagree

Aligns with practice-focused question #1

Summary

This section addressed the overall approach and rational of the project, the main aim of which was to address the issues that will help to reduce medication errors. The potential benefits of this project include to inform and improve knowledge and skills of participants about best ways to deal with medications to avoid errors or reduce them to the barest minimum and increase competencies of participants in medication administration. The long-term goal of this project is to improve patient outcome. The next section will deal with findings from the project and recommendations.

Section 4: Findings and recommendations

Introduction

A great deal of attention was drawn to patient safety by the publication in 2000 of the IOM report *To Err is Human: Building a Safer Health System.* The findings in terms of medication errors were so alarming that they prompted a number of regulatory and legislative initiatives in search of immediate solutions (Kohn, Corrigan, &Donaldson, 2000). The problem of medication errors has been demonstrated in all sections of the healthcare system including hospitals, nursing homes, outpatient settings and pediatric settings (Ghandi et al, 2000). They have become a critical issue today as they present a great danger to patient safety, with at least one patient per day in US healthcare institutions being affected by medication errors (Blumenthal, 2009). These errors have been blamed on various factors that often involve miscommunication in the care setting, including dispensation errors, dosage errors, confusion in names, and dosing unit errors (Van Den Bemt, Idzinga, Robert, Kormelink, &Pels, 2009).

Medication administration could be problematic and has serious implications as it impacts the wellness, morbidity, and mortality of patients (Harkanen et al., 2014). The meaningful gap-in-practice addressed by this doctoral project was the lack of sufficient education on strategies to decrease medication errors. The aim was to determine if a staff education in-service on strategies for reducing medication errors in an out-patient internal medicine clinic was an effective intervention for reducing medication administration errors in such a setting.

The guiding practice-focused question for this doctoral project was, "Will a staff education program improve staff knowledge about effective strategies for preventing medication errors?"

This doctoral project has the potential to address the lack of sufficient knowledge on strategies to reduce medication errors by conventional didactic teaching methods reinforced with return demonstrations. The return demonstrations are necessary, as according to Bogner (2009), the health care provider is likely to forget critical elements in provided education if conventional didactic teaching methods alone are used. Using repetitions through return demonstrations provides the staff member with the opportunity to develop skills proficiency.

The purpose of this DNP capstone project was to provide relevant information related to evidence-based strategies to reduce medication errors, including how to provide healthcare facilities with plans to encourage medication error and near misses reporting without the fear of consequences from the management or employer. The project involved testing the knowledge of the clinic staff on medication errors before educational intervention, presenting relevant literature or educational material on medication errors, return demonstration of learned information, and re-testing.

Guided by the information obtained from most recent literature and feedback from stakeholders in the internal medicine clinic, a staff education in-service initiative addressing strategies to reduce or minimize medication errors was developed in a power point format and presented to the medical/nursing staff of the clinic numbering 11 people. Before the contents of the power point were presented, a pre-knowledge survey

consisting of 15 questions (Appendix B) was distributed to all the participants. This was followed by the presentation of the power point content with return demonstrations and then a post- knowledge survey was completed by the participants to gauge the level of understanding of provided information. The pre/post-knowledge survey questions were the same.

Components of the Educational Program

The staff education in-service initiative was designed to gauge the effectiveness of an educational program in reducing medication errors through the supply of relevant, current and evidence-based information on strategies for reducing medication errors to the staff of a suburban internal medicine clinic. My role was to gather the relevant, current, and evidence-based data on strategies for reducing medication errors, develop the educational materials for the in-service (power point presentation and knowledge survey), show the material to stakeholders for their feedback, adapt the material as needed and then present the material to the staff at the clinic.

The target audience for the contents of the educational in-service initiative were the nursing/medical staff of the outpatient internal medicine clinic. The contents of the educational in-service were delivered and evaluated at a prearranged time of the day (during monthly staff meeting session) to cause as minimum disruption as possible to the everyday running of the clinic. The time allotted to this initiative by the clinic's management points to the importance of this educational training to the clinic.

Before the presentation of the information in the power point, I conducted a pre-knowledge survey. The survey consisted of 15 questions in different response formats

related to issues of medication error. Among the questions were 9 forced choice questions which according to Grove et al, (2013), eliminates the neutral category and requires that participants make a distinct and clear choice. Likert-type response format was used in 6 questions to assess agreement, evaluation or frequency (Grove et al, 2013), using a 5-point scale that included (a) Strongly Agree, (b) Agree, (c) Not Sure, (d) Disagree, or (e) Strongly Disagree.

Responses to the pre-knowledge survey were retrieved from the participants before the presentation of the power point. During the presentation phase, the participants gave return demonstrations of key information provided related to medication errors. The return demonstrations were evaluated by way of a checklist (See Appendix A) to match activities in the return demonstrations with pre-determined points that should be addressed by the participants.

After presenting the power point, an identical survey was distributed and completed by the participants to accurately assess knowledge obtained through the educational in-service. Answers to the post-knowledge survey were compared with the answers to the pre-knowledge survey to determine whether new knowledge was gained about medication error reduction based on the educational information presented.

The objective for this staff education in-service was to generate system-related health recommendations to the out-patient internal medicine clinic, translation of evidence into practice as it relates to increasing knowledge regarding strategies to reduce medication errors in the clinic, and which could be extended to other healthcare facilities, big and small, where medication errors are prevalent.

The statistical analysis approach involved use of descriptive analysis of results obtained from the knowledge surveys using the Statistical Package for the Social Sciences (SPSS) software package (IBM SPSS Statistic 24, Mac OS version) and use of the paired *t*-test to compare participants' scores on the knowledge survey before and after the educational materials were presented to determine if a change in practice exists regarding better practices to reduce medication errors. The data was collected and organized in a numerical order, which allowed for the identification of differences between data before and after intervention (Hazra & Gogtay, 2016).

Findings

Descriptive Data

Medication errors can be caused by any of the members of the health care team and can occur any time during the process of prescribing, transcribing, dispensing, administering or monitoring of medications (Radley et al, 2013). While nurses are mainly involved with committing medication administration errors, physicians are mostly associated with medication prescribing errors and pharmacies with dispensing errors (Radley et al, 2013).

The educational in-service was presented to 11 staff members (1 physician, 2 Nurse Practitioners, 2 registered nurses, 1 licensed Practical Nurse, 1 Medical Assistant, 3 Medical Students and 1 Nurse Practitioner Student) who are involved in the chain of medication use and along which medication errors could occur. The educational session and all data were collected in one day. The pre-knowledge results were first collected, followed by presentation of the in-service education session with return demonstrations,

and then the post-knowledge survey. The participants per disciplines and titles are as shown in table 2.

Table 2

Total number of participants and their disciplines

Disciplines	Number of Participants Per Level of Credential	Total
NURSING	2- NURSE PRACTITIONERS (NP) 2 - REGISTERED NURSE (RN) 1 - LICENSED PRACTICAL NURSE (LPN) 1 - NURSE PRACTITIONER STUDENT	6
MEDICAL	1 - PHYSICIAN 3 - MEDICAL STUDENTS 1 - MEDICAL ASSISTANT	5
TOTAL		11

Knowledge Survey Results

Table 3 shows the collective results obtained for each question from the participants. Each question's percentage was obtained by counting the number of correct answers by participants, dividing that by 11 and finding the percentage through multiplying the result by 100.

Table 3

Percentage results from Pre-knowledge and Post-knowledge Surveys

Pre- knowledge Survey Percentage of participants that answered question correctly	Post- knowledge Survey Percentage of participants that answered question correctly
Question 1 - 36%	Question 1 - 100%

Question 2 -	100%	Question 2 -	100%
Question 3 -	91%	Question 3 -	100%
Question 4 -	45%	Question 4 -	100%
Question 5 -	55%	Question 5 -	100%
Question 6 -	55%	Question 6 -	100%
Question 7 -	36%	Question 7 -	100%
Question 8 -	0%	Question 8 -	100%
Question 9 -	64%	Question 9 -	100%
Question 10 -	82%	Question 10 -	100%
Question 11 -	64%	Question 11 -	100%
Question 12 -	100%	Question 12 -	100%
Question 13 -	100%	Question 13 -	100%
Question 14 -	100%	Question 14 -	100%
Question 15 -	100%	Question 15 -	100%

Table 3 shows the collective results obtained for each question from the participants. Each question's percentage was obtained by counting the number of correct answers by participants, dividing that figure by 11 and finding the percentage through multiplying the result by 100.

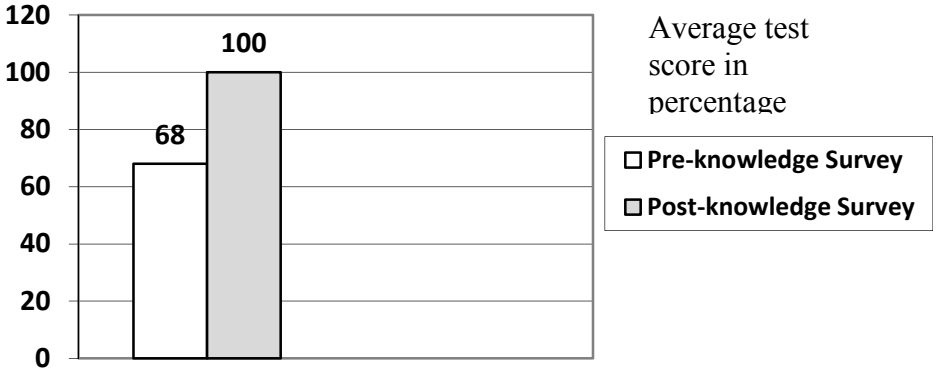

Figure 1. Bar chart showing the different results obtained for pre-/post-knowledge surveys.

The above bar chart shows that the participants' scores on the knowledge survey were increased on the post knowledge survey. The data analysis procedure involved comparing of data from the pre-/post-knowledge survey using the paired *t*-test preselected for this project (polit, 2010). The paired *t*-test looked at the relationship of the paired analysis of knowledge regarding medication errors (pre-/post- knowledge survey) for the 11 participants in the educational in-service intervention. Information provided on medication errors was expected to significantly improve the quality and safety of patient care.

Clinic Staff Responses to Items on the Knowledge Survey

The questions addressed by the knowledge surveys covered the information in the power point presentation which had been presented to some stakeholders for scrutiny and determination of relevance. The positive feedback from the stakeholders highlighted the need for the in-service initiative. Staff responses were evaluated and summarized with major themes identified (Hsieh & Shannon, 2015). Some of the themes identified

included the need for this in-service to address medication errors, sharing most recent evidence-based practice modalities to prevent medication errors and the effectiveness of the educational approach in increasing awareness of how best to minimize the incidence of medication errors in healthcare facilities.

A summary of the participants responses to the pre-knowledge survey (see Appendix B) are as follows. Questions on the statistics regarding medication errors received the least correct answers in the pre-knowledge survey. Of the 15 questions in the survey, 3 were on awareness of the detrimental effects of medication errors on individuals' health and on the nation's economy. On the question about the cost of medication errors to the United states not one participant got the correct estimate, while only 36% had an idea of how many patients are exposed to medical errors and just about half the participants (55%) knew that deaths from medical errors exceed the combined deaths caused by acquired immune deficiency syndrome (AIDS), road accidents and breast cancer (Appendix B, questions 1, 6, & 8). These questions were relevant because an improved understanding of the human and material cost of medication errors will expose the enormity of the problem and instigate more rigorous efforts to find lasting solutions to solving the problem (McCarthy, Tuiskula, Driscoll & Davis, 2017).

Overall, the participants agreed that this educational in-service is very important to the clinic as it will enhance their knowledge on and provide the latest evidence-based practice information on how best to avoid medication errors. Whereas 10 out of the 11 participants agreed that an educational in-service training on strategies to decrease medication errors will benefit the clinic, one respondent had a neutral position (Appendix

B, question 3). All the participants however said that medication error constitutes a major problem and they value the importance of gaining knowledge that is current, concise and easy to understand about ways to reduce medication errors (Appendix B, questions 2 &15). There was a very good understanding among the respondents on some issues that constitute medication errors before the educational in-service (Appendix B, questions 10, 11, 13 & 14), and a fair understanding of common themes related to medication error (Appendix B, questions 4, 5, 7, & 9). The medical and nursing personnel in the clinic were kind enough to participate in the educational in-service. There was strong agreement that an educational in-service training on strategies to decrease medication errors will benefit the clinic as evidenced from the answers to question 3 of the survey, where 100% of participants agreed (See Appendix B).

After the pre-knowledge test, the educational in-service was delivered, and participant gave return demonstrations as the in-service went along. There was a question and answer session after the in-service and then the post-knowledge survey was conducted. The participants got 100% correct answers to the post-knowledge survey which was a significant improvement from the pre-knowledge survey results where 68% correct answers were recorded (Figure 1).

Data Analysis Procedures

The results of the paired *t*-test ($t = -3.9$; $p = 0.001$) shows that the educational in-service training significantly increased staff knowledge on strategies to decrease medication errors which could benefit the clinic. Despite the small sample size, there was a significant increase in correct answers between the pre-knowledge survey questions and

the post-knowledge survey. Even though the *p*-value was significant, results on the effectiveness of the intervention could not be reliably assessed due to the low sample size.

Results

The practice-focused question for this doctoral project was "will a staff education in-service program provided to the nursing/medical staff of a sub-urban internal medicine clinic improve staff knowledge about effective strategies for reducing/preventing medication errors". The practice-focused question was answered with the pre-/post-knowledge survey which indicated that there was a significant difference between knowledge of participants before and after the educational in-service intervention due to 68% of the questions being correctly answered in the pre-knowledge survey and 100% in the post-intervention survey.

Strengths and Limitations of the Project

The strength of the project lied in the enthusiasm and zeal of the staff to learn about most current strategies to minimize medication errors brought about by the awareness of the human and financial costs of medication errors. This enthusiasm galvanized the interest of the management and staff of the clinic to dedicate time and resources to see that the educational in-service initiative took place. The knowledge that integration of the new knowledge obtained and recommendations from this project will materialize into quality and safer care for the patients of the clinic was a motivating factor for the cooperation and participation from the clinic management and staff.

Some of the limitations of the project included the small sample size which limited the generalizability of the findings of the project. A larger sample size would have strengthened the results or findings of the educational project. A forty-five-minute educational session is obviously not enough time to touch on every important point that will reduce medication errors. Also, the fact that the project was exclusively undertaken in one clinic in which the medication errors may not be as rampant as say in a hospital could be a limitation. This could have been avoided by having such a project in a hospital setting or a larger healthcare center like a nursing home or a sub-acute rehabilitation facility with larger staff numbers. In addition, the participation of only medical and nursing staff limits the reach of the educational in-service to minimize medication errors, as medication errors can occur at any time during the process of prescribing, transcribing, dispensing, administering or monitoring of medications (Radley et al, 2013). This means that pharmacy staff should also be included in such educational in-service.

Recommendations for Future Projects

The gap-in-practice can be potentially addressed in future projects by expanding the educational in-service to include a larger sample size. A much wider participant base will make for a more generalizable and reliable result about the need for such educational in-service geared towards reducing medication errors to the barest minimum. Furthermore, the inclusion of other healthcare professionals, including pharmacy staff will allow for a complete reach to all those involved in medication prescribing, transcribing, dispensing, administering and/or monitoring.

Doctoral level prepared nurses have the obligation and professional responsibility to advocate for quality and safe care of patients through the use of evidence-based practices, as well as coordinate with healthcare providers from other disciplines to provide cohesive and coordinated care. This educational in-service was able to provide most current and evidence-based practices to the clinic staff and increased their awareness about ways to achieve minimum errors while dealing with medications.

Evidence supports that there is gap in current healthcare systems practices regarding efforts towards and knowledge regarding strategies to reduce medication errors. The clinic staff acknowledged that such a problem exists and in order to ameliorate the problem, an educational in-service highlighting the various ways to decrease the incidence of medication errors was deemed very useful and necessary.

The educational initiative addressed in this paper provided an outline of the educational in-service content, delivery format, and evaluation strategies to reduce medication errors in the internal medicine clinic. The staff of the clinic agreed that the components of the educational initiative were necessary and appropriate for the clinic in its efforts to minimize medication errors. Implementing this program has the potential to decrease medication errors by focusing on the most current and evidence-based strategies for reducing the occurrence of medication errors.

Summary

Medication errors are a huge problem that needs tackling and educational in-services could be an intervention that creates the awareness about strategies to reduce their occurrence. Even in the best of circumstances, errors will still occur due to the chain

of events needed for medication administration and identifying the failures that led to the mistakes and tackling them is the best way to prevent future errors from occurring (Stefanacci & Riddle, 2016). Educational in-services could be one way to explain those tackling strategies to healthcare workers.

This project is important for the clinic and other healthcare organizations and a priority for quality care and patient safety. The findings from this project supported the use of a staff educational in-service to improve staff knowledge about effective strategies for reducing medication errors in a sub-urban internal medicine clinic. Decreasing medication errors to the barest minimum was important for the clinic and a staff educational in-service was an appropriate intervention towards promoting patient safety and ensuring quality improvement (Melnyk, Ford, & Overholt, 2014). The educational in-service with return demonstrations encouraged learning through repetition and within a safe and guided environment (Norman, 2012).

This educational initiative provided an outline of the educational content, format of delivery and evaluation strategies to decrease the incidence of medication errors in an out-patient internal medicine clinic. Implementing this program has the potential to decrease medication errors by focusing on proactive evidence-based prevention activities. In chapter 5, dissemination methods, self-analysis, summary and conclusion resulting from this improvement project are discussed.

Section 5: Dissemination Plan

Dissemination

The findings of this quality improvement and patient safety project will be disseminated via presentations to different nursing organizations (such as American Nurses Association, American College of Nurse Practitioners, International Council of Nurses, American Association of Colleges of Nursing), to the Michigan Health Department and the manuscript will be submitted for publication in peer-reviewed nursing journals (for example, American Journal of Nursing, Journal of Community Health Nursing, MEDSURG Nursing, The Journal for Nurse Practitioners). Additionally, a manuscript will be submitted to Research in Nursing & Health Journal, so the results of the project can reach all healthcare professionals involved in the process of handling of medications where potentially errors could occur. The dissemination of the findings is expected to assist these professionals to improve clinical practice for medication administration. The continued increase in fatality and cost as a result of medical errors of which medication errors are a large part has heightened the need to educate healthcare professionals on how to better manage medication administration to prevent errors.

Analysis of Self

Some of the responsibilities of nurse leaders include the implementation of advanced practice nursing roles (Bailey, Jones, & Way, 2008). During the development of this quality improvement and patient safety program, my role as a nurse leader and scholar practitioner was manifest in how I collaborated with both internal and external stakeholders in the development of the educational initiative. I projected my leadership

skills through effective communication with the management of the internal medicine clinic, organization of the clinic staff to go through the various stages of the educational in-service, and by clearly explaining to the clinic the goals and objectives of the project and how those goals and objectives align with the vision of the organization.

The entire process of the project from the onset to these concluding pages has been both challenging and rewarding. Combining the project with the core courses I took while working fulltime was demanding and equally revealing. I am now aware of my multitasking ability and know that I can achieve practically anything I set out to accomplish with determination and perseverance. Partaking in the effort to reduce medication errors in healthcare establishments gave me a sense of pride and fulfilment, knowing that the findings will serve as my contribution to reducing the incidence of medication errors.

As a nurse leader, I believe the experience gained by this project has broadened my participatory horizon and carved a pathway to future advocacy for better management of the process of medication handling to prevent harm to patients. I am convinced that the efforts, time, resources and energy expended to ensure stakeholders' participation and by-in were well spent and will assist with my continued professional development especially in the field of advocacy which dovetails with my long-term goal to be a well-recognized expert in medication safety both nationally and internationally.

As dynamic as the healthcare industry is, stakeholders buy-in to any change is an important part of the equation. To effectively manage change in any organization, it is necessary that staff and management understand what the change is about, why the

change is necessary and the positive outcomes of implementing the change. This borders on excellent communication skills as the more detailed the communication is about the vision for the change, the better the chances for buy-in and the less the resistance to the change.

Summary

Due to the serious negative effects of medication errors, many well-known and internationally acclaimed organizations including the Institute of medicine (IOM), The Joint Commission (JC), and The Institute for Safe Medication Practices (ISMP) are constantly working to reduce medication errors and have issued several mandates for health care providers to decrease the incidence of medication errors. Due to the stigma associated with medication errors, these governing bodies are encouraging the unabashed reporting of medication errors to help determine their causes and find solutions to them.

The Health Research and Educational Trust encourages healthcare organizations to appreciate that medication errors could be due to systems failures and that blaming of the workers involved has done nothing so far to minimize medication errors (HRET, 2012). It therefore advocates the embrace of a just culture so that nurses and other healthcare professionals may learn from their mistakes and improve competencies, leading to a decrease in medication errors.

The results of this capstone project indicate that an educational in-service providing information about ways to reduce medication errors does improve the competencies of healthcare professionals involved in the medication handling and administration processes and has the potential to reduce medication errors. A pre-

knowledge survey was used to determine what was already known by the participants and what information was lacking, a return demonstration allowed for assessment of ability to perform a task the right way, an educational in-service provided for filling of gaps in knowledge and a post-knowledge survey determined retention of knowledge. The results of this project validate that participating in an educational session can increase knowledge of evidence-based strategies to reduce medication errors in healthcare professionals working in an out-patient clinic. I recommend that medication errors be addressed on a yearly basis to provide latest evidence-based practices on ways to minimize medication errors and to maintain competencies of healthcare professionals involved in the handling and administration of medications.

Conclusion

This capstone project provides some evidence showing that providing information does improve the knowledge and competencies of nurses and other healthcare providers in the chain of events that leads to medication administration. The pre-knowledge survey provided a baseline of the participants' knowledge, while the post-knowledge survey evaluated the retention of information. Implementation of evidence-based practice information on a yearly and as needed basis will provide those healthcare workers with the information needed to improve competencies and ultimately patient outcomes. Improved patient outcomes will lead to a healthier citizenry, satisfied patients and families and reduced healthcare costs.

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Appendix A: Medication Administration Checklist

Name:_____ Date:_____

Criteria	Met	Not Met
1.) Check accuracy of medication order		
2.) Patient identifier at least 2 check a.) Full Name b.) Date of Birth c.) Identification d.) Medical Record Number		
3.) Assess for contraindications to patient receiving medications (allergies, Hypertension, heart rate, etc)		
4.) Perform the 5 basic Rights of Medication Administration a.) Medication b.) Route c.) Time d.) Individual e.) Dose		
5.) Medication Knowledge a.) Name (generic & brand) b.) Action c.) Side effects		
6.) Medication Preparation a.) Check medication against MAR b.) Check expiration date		
7.) Describe at least 6 strategies for preventing medication errors		
8.) Documentation		

Appendix B: Pre/Post-Knowledge Survey

1. Each year, approximately how many patients are exposed to medication errors?

a. Nearly 1.5 million
b. Nearly 4 million
c. Nearly 6.5 million
d. Nearly 8 million

2. Medication error constitute a major problem.

a. Strongly agree
b. Agree
c. Not sure
d. Disagree
e. Strongly disagree

3. An educational in-service training on strategies to decrease medication errors will benefit this clinic.

a. Strongly agree
b. Agree
c. Neutral/Not sure
d. Disagree
e. Strongly disagree

4. Which of the following errors is not a form of medication error?

a. Prescribing errors
b. Translating errors
c. Dispensing errors
d. Administration errors

5. Which of the following are part of the first 5 rights of medication administration?

		Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
a	Right Person					
b	Right Time					
c	Right Texture					
d	Right Medication					
e	Right Route					
f	Right Dosage					

6. Deaths from Medical errors exceed the combined deaths caused by AIDS, road accidents and breast cancer.

a. True
b. False

7. The following are patient identifiers for medication administration?

		Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
a	Room number					
b	Wrist band					
c	Full name of Patient					
d	Date of birth					

8. What is the estimated annual cost of medication errors in the United States?

a. Nearly $4.5 billion
b. Nearly $11.5 billion
c. Nearly $16.5 billion
d. Nearly $21.0 billion
e. Nearly $32.0 billion

9. The volume of 1 tablespoon is equal to _____ml

a. 5ml
b. 10ml
c. 15ml
d. 20ml

10. Accidentally omitting a medication during administration is not a medical error.

a. True
b. False

11. The in-service educational program will expand my awareness of what constitutes medication errors.

a. Strongly agree
b. Agree
c. Neutral/Not sure
d. Disagree
e. Strongly disagree

12. Systemic medications:

a. Affect the whole body
b. Affects a single organ or tissue
c. Come only as orally administered medications
d. Can only be injected

13. Medication errors occur only during medication administration process.

a. True
b. False

14. It is alright to take over the counter Tylenol for pain when already taking prescribed acetaminophen containing medication.

a. Yes
b. No

15. I value the importance of gaining knowledge about ways to reduce medication errors.

a. Strongly agree
b. Agree
c. Neutral/Not sure
d. Disagree
e. Strongly disagree