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Automated Medication Dispensing Cabinet and Medication Errors

Marie Helen Walsh
Walden University

Walden University

College of Health Sciences

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Marie Walsh

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Review Committee
Dr. Sue Bell, Committee Chairperson, Health Services Faculty
Dr. Cheryl Holly, Committee Member, Health Services Faculty
Dr. Oscar Lee, University Reviewer, Health Services Faculty

Chief Academic Officer
Eric Riedel, Ph.D.

Walden University
2015

Abstract

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MSN, Walden University 2012

BSN, Chamberlain College, 2010

Project Study Submitted in Full Fulfillment

of the Requirements for the Degree of

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Abstract

The number of deaths due to medical errors in hospitals ranges from 44,000 to 98,000 yearly. More than 7,000 of these deaths have taken place due to medication errors. This project evaluated the implementation of an automated medication dispensing cabinet or PYXIS machine in a 25-bed upper Midwestern critical access hospital. Lewin's stage theory of organizational change and Roger's diffusion of innovations theory supported the project. Nursing staff members were asked to complete an anonymous, qualitative survey approximately 1 month after the implementation of the PYXIS and again 1 year later. Questions were focused on the device and its use in preventing medication errors in the hospital. In addition to the surveys that were completed, interviews were conducted with the pharmacist, the pharmacy techs, and the director of nursing 1 year after implementation to ascertain perceptions of the change from paper-based medication administration to use of the automated medication dispensing cabinet. Medication errors before, during, and after the PYXIS implementation were analyzed. The small sample and the small number of medication errors allowed simple counts and qualitative analysis of the data. The staff members were generally satisfied with the change, although they acknowledged workflow disruption and increased medication errors. The increase in medication errors may be due in part to better documentation of errors during the transition and after implementation. Social change in practice was supported through the patient safety mechanisms and ongoing process changes that were put in place to support the new technology. This project provides direction to other critical access hospitals regarding planning considerations and best practices in implementing a PYXIS machine.

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I dedicated my career and accomplishments to my husband, Adam, my son Gavin, and all of my family members, especially my sister Jackie, as I would not have been able to accomplish this sought out journey without them. I would like to recognize them for their love, support, patience, and understanding. I would like to recognize other family and friends who have also been there through this journey, without them I would never have gone this far. God does play a big part in this as well, He has driven me in this direction and I would not be in this position without Him.

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Overview of the Evidence-Based Project

Sorelle (2000) reported that medical errors occur in thousands of lives every year. The Lancet (2011) reported the cost of medical errors across the nation was $17.1 billion in 2008. "More than one in six prescribing errors involved miscalculation of dose, wrong decimal point placement, incorrect expression of unit of measurement, or an incorrect medication administration rate" (McDowel, Ferner, & Ferner, 2009, p. 3). It is a high priority for healthcare facilities to prevent the number of medical errors and improve patient safety. The goal of this study was to examine the implementation of an automated medication dispensing cabinet in one hospital and identify what errors occurred when and how they were resolved.

Problem Statement

The problem that I addressed in this project was medication errors can cause significant harm to patients, additional hospital days, and a larger financial burden for both the hospital and the patient (Radley et al., 2013). Not many researchers have focused on how a medication dispensing cabinet (AMDC) prevents medication errors where the machine is the main focus of the study. With an estimate of 380,000 preventable adverse drug events recorded each year in hospitals, there are another 450,000 medication errors that are not accounted for (Institute of Medicine [IOM], 2006).

One critical access hospital in Montana found a 25% reduction of medication errors at their facility after implementing an AMDC and bedside medication verification (BMV) to dispense their medications (Wilkinson, 2013). Another hospital implemented a

carousel system that automatically dispensed compact medications that did not need to be refrigerated; its implementation resulted in a dispensing error reduction from 0.25% to 0.018% (Cheung, Bouy, & Smet, 2009).

Care Fusion (2009) identified how a PYXIS Procedure Station had successfully improved workflow and supply organization in an operating room. However, it is unknown if the procedures implemented around the use of the AMDC, the use of the AMDC, or both decreased the medication errors. With little research conducted on this issue, more information is needed in this area. For that reason, the purpose of this project was to discover whether a medication dispensing machine prevented medication errors or not. Identification of all the different resources that are needed to use this machine correctly is necessary to see if the machine itself or the procedures implemented around it help to eliminate medication errors. In this project, the focus was on how medication errors occurred and how, with the use of a medication dispensing machine, medication errors can be prevented.

Purpose Statement

The purpose of this project was to conduct a process evaluation of the implementation of an AMDC and associated policies and procedures in a critical access hospital. Implementing a process evaluation project like this is important for healthcare because it may identify the particular challenges of implementing the mandates of the Affordable Care Act (ACA) of 2010 in a small critical care hospital with limited resources both human and financial. The ACA (2010) has been enacted to provide a safer

health care delivery environment for all patients, but all hospitals are not equally able to incorporate the law.

Along with implementing the use of an AMDC, facilities need to implement an electronic health record (EHR) at their organization to facilitate electronic physician orders or e-prescribing and a connection between the physician orders, the pharmacy, and the AMDC. From my knowledge most critical care access hospitals have implemented an EHR and BMV; this is most likely not the case for some critical care hospitals because of the lack of funding and personnel they may have. Without an EHR and BMV, these hospitals are not as current as other facilities, the quality improvement tools used elsewhere may not work properly, and these deficits may result in even less funding from the government. The result would be a decreased ability to serve patients who are already at a disadvantage due to their distance from the facility.

Critical access hospitals are hospitals that participate in Medicare and also has a State flex plan, which is a State rural health plan. These hospitals must be located in a rural area, have 24/7 emergency services, have no more than 25 inpatient beds that can also be used as swing beds, have an annual average length of stay of four days or less, and be in a location that is less than 35-miles from a hospital or other critical access hospital (U.S. Department of Health & Human Services Health Resources and Services Administration Office of Rural Health Policy [HRSA], (2010).

In this study, I focused on one critical access hospital in the Midwestern United States. The hospital has 25 beds, with 10 of them used as swing beds (beds used for patients with an uncomplicated procedure and can be covered under Medicare) that are

included on the only nursing unit. There is a surgical unit, x-ray department, a phlebotomy lab, a walk-in clinic, and 24/7 emergency services with a physician on-call at all times. This hospital is not part of a healthcare system, but is located 20 miles away from a 500 bed tertiary teaching hospital and near a clinic that provides more than 80 specialties and subspecialties to the public.

Prior to the implementation of an AMDC, this critical access hospital had the physician manually write the order on a physician order sheet and send the order to the pharmacy where the pharmacists and pharmacy technicians would interpret the order, process the medications, deliver the medications to the nursing unit, and fill the medication cart for the nurses. The nurse would then administer the medications to the patient by first checking allergies and then matching the medications, dose, route, time, and patient against a paper-based medication administration record (MAR). The medications were taken to the patient's room, the patient was identified by their name band, and the medications were given to the patient. Providing more preventive procedures in medication administration versus using old and outdated processes will aid with health care costs. The participating hospital needs to be proactive and provide staff with equipment to enable them to pass medications efficiently and safely if they are going to remain solvent in the post ACA world.

Project Objectives

The one project objective was to complete a process evaluation of the implementation of the AMDC in a critical care hospital. Hodges and Videto (2011) defined process evaluation as the method to explain, observe, and report institutional and

course -correlated aspects to advance the efficiency of the project; present support for the preservation of the project; specify if assumptions and models have been applied suitably; assist in explaining why the goals and objectives have or have not been accomplished; and to assist in formulating conclusions about the project and its mechanisms. The hospital's goals in implementing the AMDC were to provide an improved process for medication administration, reduce or eliminate the number of medication errors that occurred within the facility, reduce errors related to the cause of medication errors, and educate nurses on the new equipment and processes. Attainment of these goals occurred within 6 months after implementation of the AMDC.

Significance to Practice

With the additional provisions of the ACA being implemented currently, it will be important to have the best care possible available for this facility's patients (U.S. Department of Health & Human Services, 2014). The ACA will influence strongly how healthcare is delivered, organized, and reimbursed (Bodenheimer & Grumbach, 2012). Knowing that the participating hospital needed to make changes to its processes made this project a part of the overall effort of the hospital to comply with the changes introduced by the ACA. Improved patient care was expected to result as was a patient experience that is safer, has a reduced length of stay, and exhibits decreased overall costs.

Project Questions

Three questions that I addressed in this project were:

1. Does implementing an AMDC reduce medication errors?
2. Was the change process to implement an AMDC successful?

3. What are lessons learned in the process of implementation of the AMDC for other critical care access hospitals?

Evaluating how an AMDC was implemented and contributed to the nursing process in one small hospital may create a path to follow for other critical access facilities. With the proper AMDC administration and processes, nurses and healthcare professionals can feel more confident with their daily tasks related to medication administration. Assurance with what medication is being removed from a specific locked drawer versus sifting through a pile of medications may make the nurse feel more confident with medication passes. A referral hospital in Florida that implemented the PYXIS Procedure Station found that prior to the system implementation there were immense troubles with physician trust of nurses and nursing staff satisfaction (Care Fusion, 2009). Nurses may be more comfortable and the process of medication administration may progress more smoothly when the medication pass is conducted utilizing an AMDC to retrieve medications.

Evidence-based Significance of Project

This evidence-based project provides useful information that can help with problems that may occur with the implementation of an AMDC elsewhere. Examining data before and after the implementation of the AMDC is helpful to identify the number of errors that occurred and what types of errors there were. Preventing medication errors in a critical access hospital leads to at least one medication error per day and one-fourth of these errors could have been prevented by including the pharmacist when the prescription was being written (Stratton, Worley, Schmidt, & Dudzik, 2008). The

Institute of Medication (2006) reported that there are more than one medication errors that occur daily within hospital settings and about 1.5 million of them are preventable. A study completed by Unver, Tastan, and Akbayrak (2011) found that 42% of medication errors were reported by both novice and experienced nurses. This means 58% of medication errors went unreported and the cause and effects were not known. This project provides important evidence that can make a difference in the continued transition to the AMDC and, ultimately, reduce the number of medication errors. Medication errors can be found and processed, and equipment improvements can me made based on the errors that occurred, when they occurred, and personnel involved in the error. Policies regarding how to handle any discrepancies with the medications, physician orders, and patient characteristics need to be examined.

Implications for Social Change in Practice

There are disparities in access to hospital healthcare due to the limited resources within critical access hospitals. With the limited resources in critical access hospitals, updating an organization may seem overwhelming; however, it is necessary to obtain the benefits of an electronic health record (EHR) and computerized prescriber order entry (CPOE) programs to avoid penalties from the government (Horning, 2011). This process evaluation on the implementation of an AMDC provides direction to other critical access hospitals regarding best practices in implementing this change with limited resources.

Social change in practice has taken place with this project due to the verity that new technology was implemented at a small hospital. While this change is expected to create a safer patient environment and improved satisfaction for healthcare employees,

the process evaluation has uncovered areas of improvement. Halvorsen and Emerman (2013) described change as encouraging a hospital or healthcare facility to join people together with families and assets that they will need to have a healthy life. The new AMDC does provide for an optimal hospital stay due to the new equipment, policies, and procedures that were put into place during this project. This small hospital located in a small Midwestern community is able to communicate the safety changes around medication administration to the public, which will as Church (2001) pointed out result in social change through increased medical involvement in identifying a problem, analyzing it, and initiating changes to correct it. Best practices and pitfalls regarding implementation of an AMDC in a small critical access hospital can be a model for other hospitals facing similar issues of geography, size, and economics.

Definitions of Terms

The terms that I used in this project were:

Medication error: is the "failure in the treatment process that leads to, or has the potential to lead to harm to the patient" (McDowel, Ferner, & Ferner, 2009, p. 606).

Automated medication dispensing cabinet (AMDC): is a device that holds the medication in locked drawers until the pharmacy re-fills the drawers or the nurses need to obtain the medications (Polisher Research Institute & IDEAS, 2013). Tracking and monitoring of the cabinet stocking are done with a computer located in the pharmacy.

Bar code medication administration (BCMA): is a machine used in the identification of the right medication, the right time, and the right patient (Rouse, 2012).

The BCMA system puts the nurse at the bedside while performing the five medication rights.

Five medication rights: are "the right patient, the right drug, the right dose, the right route, and the right time" (Federico 2014, p. 1).

Assumptions and Limitations

In this project, I made several assumptions. First, was with this new technology, medication errors would decrease due to the ease of administration and accuracy of the devices. The limitations of this project were that it took place in a critical access hospital that had recently implemented these new technologies. Because this technology was new to the staff, there were some limitations with how to use the equipment. Education sessions were mandatory for the staff during the implementation phase; however, some individuals may not have understood or retained the information from the education sessions. Therefore, the new tools were not used correctly and there was some misunderstanding about how to use the new technology.

Some errors may be prevented in the future with corrective action and further education. Knowing what data needed to be collected and in what way was helpful for the outcome of the proposed process evaluation. The study was also limited by a small sample size at one facility, limiting the generalizability of the findings. Finally, individual nurses did not realize the benefits of using the AMDC as an improvement, so getting them interested and keeping them interested and compliant was an additional limitation (Hodges & Videto, 2011).

Summary

The recent literature suggests that nurses, pharmacists, pharmacy technicians, and patients can feel more confident about the medications that are being distributed through the use of an AMDC (Care Fusion, 2009, 2010). With the previous medication pass being done by the pharmacists, pharmacy technicians, and nurses, there were some medication errors at the project hospital. Eliminating or even identifying the cause of those errors is sometimes difficult, especially when the literature shows that a significant percentage of errors are not reported based on the variation of reports between similar hospitals (IOM, 2006).

With the new AMDC, errors could be identified, traced to the origin, and addressed. Knowing the exact number and type of medications that are in a specific locked cabinet at a certain time can reassure individuals using the medication cabinet that the right medication, dose, time, route, and patient are being identified within the computerized cabinet so that there is less room for error. With the AMDC technology, processes were expected to be improved and a safer atmosphere developed. Collecting date before and after the implementation of the AMDC was helpful in the evaluation process of implementing the AMDC system. Included in this article are different research projects that were completed and useful theories that are adequate for this change. The next section will discuss the purpose of this project, the general and specific literature that was reviewed, and the different theories and frameworks that were used for this project.

Section 2: Review of Literature and Theoretical and Conceptual Framework

Introduction

The purpose of this project was to conduct a process evaluation of the AMDC implementation in a Midwestern critical access hospital. In this section I will cover the literature that was reviewed, and the different theories and frameworks that were used for this project. The database that I searched for this project was CINAHL Plus with Full Text on-line. The key terms that I used in the search were: *medication errors, AMDC, BCMA, and the Five medication rights*. The articles that I selected for review were dated from 2008 to the present and were published in English. There were many related articles; however, 11 articles were used to provide the evidence for this project.

General Literature

Researchers have focused on identifying medication errors in healthcare facilities. Appendix A presents characteristics of the studies included in this a literature review. Sorelle (2000) reported that medical errors occur in thousands of lives every year. The Lancet (2011) reported the cost of medical errors across the nation was $17.1 billion in 2008. "More than one in six prescribing errors involved miscalculation of dose, wrong decimal point placement, incorrect expression of unit of measurement, or an incorrect medication administration rate" (McDowel, Ferner, & Ferner, 2009, p. 3). It is a high priority for healthcare facilities to reduce the number of medical errors and improve patient safety.

The number of deaths due to medical errors can range anywhere from 44,000 to 98,000 individuals yearly in hospitals (IOM, 2006). Freund (2008) stated that more than

7,000 deaths have taken place yearly due to a number of medication errors. With this number of deaths occurring due to medication errors, length of stay in the hospital would also be longer due to the detrimental reaction to the medication that had reached the patient.

Horning (2011) discussed how overwhelming it can be to implement and electronic health record system that interfaces with an AMDC. According to Horning (2011), one of the ways to reduce errors was to provide a real-world environment to the pharmacist so that possible errors can be prevented. Gaining control over medication errors can help decrease medical costs. This is exactly what Grant (2006) did by using an AMDC, implementing policies and procedures, and changing the work flow within the facility. Based on these reports, the evidence supports the use of the AMDC or other medication dispensing equipment to reduce medication errors, increase patient safety, improve staff satisfaction and efficiency, and decrease the annual pharmacy budget.

To stop errors from occurring, hospitals need to make system-wide changes (Wilkinson, 2013). These changes can include implementing an AMDC in the hospital setting. Providing a BCMA device can help the nurses with the five medication rights. Implementing policies for the staff can help to guide them through the changes of a medication pass. Another change would be to educate the staff on a quarterly basis and as needed to help them maintain their competencies in the use of the AMDC and the medication distribution process.

Matten et al. (2011) wrote about best practices to help nurses identify and teach smoking cessation techniques to patients. The authors observed that if control is

allocated to nurses after education their teaching of the patients improved. The educational intervention was a 3-hour class that included a pretest and posttest, along with a lecture, role playing, and a hand held booklet for the nurses (Matten et al., 2011). Applying a pretest and posttest design, the authors of the study were able to see what staff members learned from the class.

The education was delivered using a self-learning system that included role-playing and a hand-held pamphlet. Self-learning systems take feedback on how the program works, which is then analyzed and adjustments are made (Kettner et al, 2008). The smoking cessation program evaluated by Kettner et al. (2008) was compared with three similar programs and there were similar findings. The first program found that after a 30-minute class there was an immediate change in educated individuals, and the second showed that a 6-hour program increased advanced practice nurse's knowledge on smoking cessation and self-efficacy after two weeks. In the third program, home-care nurses were educated on smoking cessation options and 6 months after the program implementation there was an evaluation to determine if improvements were seen (Matten et al. 2011).

The education for the AMDC implementation was built on the Matten et al. (2011) and Kettner et al. (2008) examples. Following these examples for the education of the nurses in this project helped them to learn about and use the new equipment. Data collected provided an indication of what they have retained from the class. Based off of this information, more classes may be needed to reiterate and reinforce the material as well as inform the staff nurses of any additional changes that will be made.

Individuals who have an interest and knowledge about a subject should be asked to become members of the team to develop and implement a program. It is important to have one individual as a lead communicator. This individual needs to have the leadership skills to communicate with all the levels of stakeholders and representatives of the clinical disciplines (Compas, Hopkins, & Townsley, 2008). With one go-to person, all parties involved in the project development and implementation will know who to address with questions and concerns encountered as the project evolves. This individual can communicate issues and details with the project team and keep everyone involved in the changes. The chief nursing officer (CNO) is the person who was designated for this role in the participating hospital. The CNO was able to communicate with the lead individuals on each unit and have them convey the project information to their staff.

Specific Literature

A project that was conducted in an acute care hospital in 2008 indicated that 12-core measures that were implemented with their AMDC helped reduce medication errors (Helmons, Dalton, & Daniels, 2012). The authors found different types of medication errors such as the wrong medication, the wrong dose, and wrong form of the dose at their facility. With the implementation of the 12-core measures, errors were decreased by 77% from 62% errors per 6829 pockets that were refilled to 8 errors per 3,855 refilled pockets (Helmons, Dalton, & Daniels, 2012). The 12-core measures included: supplying the right environment for the AMDC, having the right security, using pharmacy-profiled cabinets, making sure the right data are seen on the screen of the cabinet, having the right inventory in the cabinet and maintaining it, including the right configuration for the

machine, creating a policy on the correct way to restock the machine, having a protocol on the correct procedure to retrieve medications, including a policy about medication overrides, initiating a protocol on how to take the medications from the machine to the bed-side, creating a policy on destroying medications, and keeping a schedule to educate the staff for competency validation (Helmons, Dalton, & Daniels, 2012).

In addition, medication refill errors were reduced by 48% in an acute care facility in Colorado after the implementation of a PYXIS-PARx system (Care Fusion, 2010). With this reduction in refill errors, the hospital eliminated an unnecessary risk for their patients. Paperella (2006) had conducted a systematic review of the Harris Interactive poll and the Pennsylvania Patient Safety Reporting System to see what can be done to prevent medication errors with the use of an AMDC.

In this review, Paparella (2006) found that the AMDC does help with organization of medication which can be a safety mechanism but these machines are not known to have a considerable contribution to reducing medication errors but may increase the amount of medication errors that occur. Other pieces that they have included in their article are ways to help prevent medication errors from occurring. Examples from this list are to have enough machines so there are less trips down the hall for the nurses, be conscious of hoe technology changes over time, and use a bar coding program to stock, retrieve and administer the medication (Paperella, 2006). Information such as this has helped with this AMDC project to gain an understanding of what other projects have found with an AMDC and how to make changes after an implementation of the machine. In regards to providing safe care to patients with an AMDC, Fung and Leung (2009) did a

systematic review of articles and research projects to identify if an AMDC does help with patient safety. They found that these cabinets can provide safety for patients with the help of a CPOE and bar-coding applications in place. After an implementation of an AMDC there was an increase of reports of medication errors that have been made by these cabinets (Fung & Leung, 2009). Knowing how an AMDC impacts the acute care setting did help with this project, because of what other hospitals have found to work or not work.

Conceptual Models, Applicable Theoretical Frameworks

For my project, the stage theory of organizational change was used. This theory looks at an organization as a whole and identifies how to create new goals and programs, using equipment and ideas (Hodges & Videto, 2011). Kurt Lewin was the first individual to use stage models. The most modern pieces of this theory are from Lewin and Roger's diffusion of innovations theory (Glanz, Rimer, & Viswanath, 2008). Investigating how an organization carries out their daily routine using the stage theory of organizational change can help identify where change is needed and what actions should be taken to ensure its success. With a good idea of how the workflow is conducted within a facility, new ideas and technology can be implemented that are complementary to the current processes.

Four stages (see Appendix B) are present in organizational change: awareness, adoption, implementation, and institutionalization (Hodges & Videto, 2011). Each stage needs to occur for a successful change to take place within the organization. This theory guided the process changes that needed to be made in implementing the AMDC at the participating hospital. The model was an aid for the presentation of the process

evaluation results to the healthcare facility. Without the consent and buy-in of the healthcare facility and its stakeholders, this project would never have succeeded and the implementation would not be sustained.

The stage theory of organizational change identifies the awareness stage as the time when the organization understands that a change is needed. The organization's management buy-in, along with a written or oral summary of the new process was needed to move to the next phase. The initiation phase that follows consisted of obtaining authorizations and developing policies, procedures, or directives for the new process. Making sure all of the stakeholders fully understood what was going to occur at that point was crucial before moving on to the next stage. Implementation occurs as the third step. This phase is when the change is put into practice. Assuring that the persons who are training staff members were fully trained themselves was an important part of this stage. These individuals did then help with problems that have come up and did answer any questions that have emerged. The final phase is institutionalization. In this phase, the project was embedded in the process of the organization, and it was not thought of as a new or different system but as part of the organization's culture. In this phase, lead individuals support the program and tended to any barriers that arise (see Appendix B). These project champions needed to be identified for project sustainability (Hodges & Videto, 2011).

The stage theory of organizational change was helpful in identifying that medication errors do occur within the facility and acceptance that using the AMDC will improve the quality of medication passes. Gathering information as this project moved

through each stage was the role of the project team the project facilitator. Then, making sure there were lead individuals who did see that the change is needed and was appropriate for the organization did help the project proceed into the final stage when project champions, with the help of administrative personnel, supported the program and kept it running successfully.

The social cognitive theory was also be helpful in evaluating the implementation of this project. This theory stated that a behavior arises from the constant, bidirectional interfaces of people and their environment, and that those behaviors affect the people and their surroundings (Hodges & Videto, 2011). Identifying how a nurse performs their medication pass helped identify where change was needed or where an error had occurred. It also helped to provide context for implementing changes most compatible with current practices.

According to Boston University School of Public Health (2013) this theory, the social cognitive theory, was originally called the Social Learning Theory (SLT) in the 1960s. The five constructs included within this theory are: reciprocal determinism, behavioral capability, observational learning, reinforcements, expectations, and self-efficacy (Boston University School of Public Health, 2013). Each of these constructs has different concepts that can be used in a wide variety of research studies. Using some of them was helpful with the process evaluation of the different stages of this project. Evaluating the data that was collected by the hospital did help stakeholders see where the hospital is in relationship to acceptance of the ADMC for reducing medication errors and this would be reciprocal determinism according to the model. Another concept that was

helpful was the determination of the necessity for reinforcement of the use of the new equipment and procedures. The last two concepts that were helpful in this project were expectations and self-efficacy. Both of these concepts relate to the expectations of the nursing staff, comparison of the expectations with the reality in practice, and the nurses' self-efficacy with use of the AMDC and the new processes.

Summary

The reviewed literature helped to identify methods to prevent medication errors from occurring with the use of an AMDC or a PYXIS machine. It also identified the need for concomitant implementation of a computerized physician order entry to help reduce medication errors. Finding the changes that have been used successfully elsewhere to improve medication administration and decrease errors did provide good insight on what needed to be done as an organization adapts new technology and practices. The next section will discuss the methodology of the project including the project design and methods, population and sampling, the data collection, and the project evaluation plan.

Section 3: Methodology

Project Design and Methods

Evaluation is essential to the development of a program, there should be evaluation at every level of the program to make sure each area is considered. In this section, I will provide information on the process to implement a new program to help prevent medication errors within a critical access hospital. Providing a mission statement, goals, and objectives are only the starting point of developing a program. Hodges and Videto (2011) stated that, "a good philosophy statement sets the stage for the program and helps to provide the rationale and justification for its existence" (p. 159).

In this study, I used convenience sampling for the process evaluation of this project implementation. Convenience sampling is a way to collect information by choosing certain individuals that are able to partake in a survey in an easy location such as via e-mail (Terry, 2012). The CNO decided it would be best to use each nurse that worked within the critical access hospital to be a participant in this survey. A survey to individuals who work directly with the AMDC was used to gather qualitative information about the device and its implementation. This survey was e-mailed out by the CNO 1 month after implementation of the PYXIS machine and was also emailed by the facility 1 year after the machine has been implemented. The survey consisted of 8 questions about the new machine and the new processes. Staff member satisfaction data was also collected with the second survey (see Appendix C and D). This project was completed at a critical access hospital that uses only one AMDC.

The process evaluation of this project took place at a critical access hospital. The staff members and managers were informed through e-mails and in person by me regarding the objectives of the process evaluation and how the data was to be collected. With the help of the CNO, the information was distributed by the CNO across the hospital. Communication with the individuals who track the errors was also a large part of gathering the information that was needed for the final report.

Individuals who worked directly with the AMDC product were beneficial to this project. I obtained the data that the hospital collected on the medication errors that occurred pre- and post-implementation, obtain hospital collected data from both the surveys, and interviews of the pharmacists, MDs, CNO, nurse managers, and staff nurses regarding any needed modifications to the process around the AMDC machine implementation.

Population and Sampling

According to the CNO there were 25 nurses and pharmacy personnel employed at the project hospital. There were others who were stakeholders that were also involved with this project. They included the chief nursing officer, the chief financial officer, the chief executive officer, the managers within each department and the nursing unit, and the information systems personnel. Each of these individuals were asked by the CNO to provide their input on the new hospital process by completing the final survey.

The pre- and post-implementation surveys did help the staff members provide direct input into the evaluation. Huddles and education updates were provided by the CNO for all staff throughout the new process role out. Pharmacists monitored

medication errors before and after implementation of the AMDC. Nurse Managers monitored medication errors due to illegible handwriting and nurse error. The CNO evaluated the cost-benefit of the medication administration system and determine the sustainability of the project.

Data Collection

The data was collected for this project without patient or healthcare provider identifiers. The medication errors that have occurred, and all the details regarding the root causes of those errors, are included with the information that is provided in the process evaluation for this project. Data collected for the project was anonymous: the process evaluation report did not include personal identifiers for patients or staff members. Institutional Review Board (IRB) approval was not required from the hospital because this project was deemed to be a hospital quality improvement project completed as part of the DNP preceptorship. Walden University IRB approval was sought and approved before the project evaluation data was received and analyzed, the number that was given for this was: 09-10-14-0304179.

Using surveys to collect information about the program and what can be changed or kept the same was another way to evaluate the program. A website was used to create the surveys for this project and uses a URL for each individual to access the survey. The nurses, pharmacy personnel, and the lead managers of the hospital have been involved with all phases of this project. Each of these individuals did provide feedback on the project that will make it run smoother in the future. They also provided first hand experiences to make improvements in the AMDC.

The surveys completed by the staff members, the interviews conducted with management personnel, and the medication errors that occurred in pre-implementation, during implementation and 1 year post implementation, provided feedback on the project's effectiveness and the staff's satisfaction with both the AMDC system and the process of developing and implementing the project. Changes that occurred in the development and implementation of the project were identified in the process evaluation report. The CNO's cost-benefit analysis determined if the new process was cost effective. The pharmacist's evaluations of the number and type of medication errors are also reported.

Project Evaluation Plan

Identifying what has been effective and how efficient the program is did help identify where changes were needed and what was successful. With the help of this process evaluation, the project nurses and hospital stakeholders are well informed of the projects impact on medication administration.

Comparing what the nurses and pharmacy personnel had to say at each interval did help determine if the change has been successful or not. This project resulted in a process evaluation report that includes the following deliverables:

- An analysis of the qualitative data from the surveys in themes.
- A table of the type and number of medication errors from 3 months before implementation of the PYXIS machine, 3 months during the implementation process, and 3 months after. ANOVA was to be used to analyze these results if there was a large enough sample.

- Recommendations for other critical access hospitals planning to implement the cabinet.

Summary

Several methods were used to collect the data for the process evaluation, these included: surveys completed by the nursing staff members, the interviews conducted with management personnel, and the collection of medication errors. The surveys helped me to identify necessary changes to improve the medication administration process using the AMDC. The final surveys helped me to determine the success of the new process in achieving staff member satisfaction around medication administration. Cost-benefit of the process change was calculated by the chief nursing officer in order to determine sustainability of the project. The final analysis from the pharmacists did show each of the medication errors that occurred. This data will be compiled and presented by me to the hospital as a process evaluation report to show where the project has been successful and where improvements may be needed. The next section will discuss the findings, discussion and implications of this project.

Section 4: Findings, Discussion, and Implications

Introduction

The purpose of this project was to help identify what changes needed to be made to create a safer medication administration environment for current and future patients at a 25-bed upper Midwestern critical access hospital. The findings reported in this section include a description of the medication administration process that occurs with the AMDC, the perceived effectiveness of the new process in achieving accurate and timely medication administration, the staff member and administrator satisfaction around the medication administration process using the AMDC, and the number of medication errors before, during, and after the implementation of the AMDC. In the evaluation project, I addressed the following questions about the implementation of the system:

1. Did implementing an AMDC prevent medication errors?
2. Was the change process to implement an AMDC successful?
3. What are lessons learned in the process of implementation of the AMDC for other critical care access hospitals?

Findings

The project questions were answered based on individual comments about the implementation of the AMDC through in person interviews, two separate anonymous surveys, and reported/recorded medication errors that occurred over the project time frame. The initial survey was distributed in June 2013, 1 month after the implementation of the AMCD system, and there were a total of five respondents out of the 25 total staff

members contributed to the results. The responses to the survey questions are reported below (note that not all five respondents answered each question):

Question 1: What challenges do you come across with the PYXIS machine? (4 out of 5 answered the question).

- "Malfunctioning drawers/doors, missing or low quantity of medications" (P1).
- "As it is a new implementation, the only problem we are having is having the correct medications and doses in it" (P2).
- "At times do not have the medication in the PYXIS. Medications that we use frequently such as Vicodin 5/325. Checking that medications patients need in the pm and night shift are stocked" (P3).
- "When orders are not checked off by pharmacy, there is an increased chance of errors because we are now pulling the meds from PYXIS instead of having them separated out in the drawer" (P4).

Question 2: Do you find it easier to remember the time a medication was administered? (5 out of 5 answered the question).

- "No. One more source to check." (P1)
- Four "no" responses were given with no elaboration. (P2, P3, P4, P5)

Question 3: Does the PYXIS system help you with the five patient rights? (5 out of 5 answered the question).

- "No medical record number on the patient's name band. The number in the PYXIS is the admission number." (P2)
- Four respondents answered "yes" without further elaboration. (P1, P3, P4, P5)

Question 4: Are you able to identify any differences between the doctor's order and what the order says in the machine? (5 out of 5 answered the question)

- "Yes, often." (P1)
- "We currently do not have that option enabled." (P2)
- "Not at this time." (P3)
- "Yes" (P4)
- "They don't go to the machine at this time." (P5)

Question 5: What types of problems have you come across with this system? (5 out of 5 answered the question)

- "Auto substitution of problems, where the same medication was used but at a different strength" (P1)
- "None." (P2)
- "No major problems." (P3)
- "Both names of the medication are not in the system." (P4)
- "Figuring out the right dosage/pills to use when the amount ordered doesn't correlate with the dosage in PYXIS. The amounts are not consistently written in/checked by pharmacy." (P5)

Question 6: Are you able to recognize and write out medication errors due to the new system? (5 out of 5 answered the question)

- "Not necessarily." (P1)
- "Yes." (P2)
- "Not applicable at this time." (P3)

- "Haven't run into this problem yet." (P4)
- "Yes, it does seem easier to pick up on some errors because you can look back and see what was pulled, but I also feel like there are more errors with that since they are not separated out for the patient. I would think this would get better with use/when we have the medication orders in the system." (P5)
- Question 7: Has this system been easy to learn? All five respondents answered "Yes." (P1, 2, 3, 4, & 5)

Question 8: How long have you been using this system? Have you used it before? (5 out of 5 answered the question)

- "Used it before. Some non-routine uses still learning." (P1)
- "We implemented it a month ago. I have used it in other facilities." (P2)
- "Three weeks; used a PYXIS in a clinical rotation." (P3)
- "One month, yes I have used this system before." (P4)
- "I used it some in clinicals while in school." (P5)

Question 9: Does the PYXIS system help with your time management techniques? (5 out of 5 answered the question)

- "Actually hinders as we have only one system and have to take turns with other co-workers with its use." (P1)
- "Not yet." (P2)
- "No, not at this time." (P3)
- "No." (P4)
- "Not really." (P5)

Question 10: Are there any improvements that need to be made to the system, if so please explain? (4 out of 5 answered the question)

- "Pharmacy staff co-initialing meds, and when something is requested and it is not placed in the system." (P1)
- "Have a bigger waste bin." (P2)
- "Just what needs to be stocked mainly; it will get there; just have to be patient. Think it's a good thing!" (P3)
- "Make patient profiles and have all the medications the patient is on listed just under that person." (P4)

Based on the answers of the five participants, nurses needed to adjust to the system and an adjustment to the medication pass was the biggest need. The nurses really needed to watch how the order was written for the dose and the correct name. They also needed to watch what medication they were pulling out of a drawer to make sure it was the correct medication name. The name brand may have been written in the order and the PYXIS machine only stocked the generic name. One individual summed up how the new system worked, "Malfunctioning drawers/doors, missing or low quantity of medications."

The EMR was implemented at the same time as the PYXIS machine and the technology needed to work together with the physician order entry and patient profiling. This was not the case at this small facility. The physician was able to use the order entry method but the patient profiles were not used due to the pharmacy not being available 24/7. This adjustment to the new equipment and the electronic health record was a challenge for the staff.

The follow-up survey was distributed by the Director of Nursing and was available from July 2014 to October 22, 2014 approximately 1 year after most of the nurses began using the system. The second survey was used to identify how satisfied the staff members were with the new machine and to collect information about ongoing or new problems with the implementation of the system. The survey was sent to 25 staff members. A total of six staff members (26%) responded to this 1-year post implementation survey. All questions were answered by each of the 6 individuals.

Question 1: What challenges do you come across with the PYXIS machine?

- "When the drawers will not open. When the wrong med is in the drawer. When the med is not there and pharmacy has left for the day." (P1)
- "There really are not any challenges." (P2)
- "I have not had any challenges with PYXIS." (P3)
- "Meds do not match up with meds in e/mar." (P4)
- "Not all drugs are available." (P5)
- "None at this time." (P6)

Question 2: How does charting differ from previous methods with the use of the PYXIS machine?

- "No real difference noted." (P1)
- "It really only changed since we went to the EMR; otherwise, PYXIS didn't affect charting." "Charting has not changed." (P2)
- "Scanning versus writing down time administered with initials." (P3)
- "?"(P4)

- "Used all paper charting/MARs prior to installing PYXIS and the EMR." (P6)

Question 3: How does the PYXIS system help you with the five patient identifiers (the right patient, drug, dose, route, and time)?

- "You have to put in the correct patient. Almost always the correct meds are in the drawer that opens. You have to be diligent about route and dose. You just need to check a med and if unsure look it up or reaffirm with the physician that this is the med and dose he is ordering." (P1)
- "It helps with the rights when picking the right medication versus when we had the chart that we would pull from that was non electronic." (P2)
- "It helps me do two of the three checks needed. Second check in process." (P3)
- "It helps with the second check in process." (P4)
- "It doesn't help; three checks for the five rights are still done, just using a different method to obtain the drug." (P5)
- "Since our PYXIS is not "profiled" to individual patient orders, it does not cross check that the correct medication is being pulled. However, one can review the history and verify the correct med was pulled, and the time it was removed." (P6)

Question 4: Comparing to before the implementation of PYXIS, how would you explain your confidence level with the medication retrieval now?

- "I believe it has increased my confidence level. If I take the time to make sure I am placing the order correctly, then I am giving the meds as ordered. You just have to make sure you are not counting on the machine to do your thinking for you." (P1)

- “It is about the same.” (P2)
- “I feel very confident in medication retrieval.” (P3)
- “Same.” (P4)
- “Same.” (P5)
- “It has increased somewhat.” (P6)

Question 5: How often do you think medication errors are occurring after the implementation of PYXIS?

- “Less, much less. Just be diligent with how you place the order.” (P1)
- “Initially, they increased and now I think they are down.” (P2)
- “Not as often as prior to implementation but they still happen.” (P3)
- “Med errors would be lower if PYXIS were profiled.” (P4)
- “Just as often, using PYXIS doesn't prevent errors.” (P5)
- “Less frequent.” (P6)

Question 6: If there are medication errors, how can they be prevented using PYXIS?

- “Do not just figure the right med is always in the drawer which opens; always double check the order against the med you have withdrawn.” (P1)
- “Scanning prevents more errors than PYXIS.” (P2)
- “Interfacing eMAR with PYXIS.” (P3)
- “Use it correctly, scanning medications and patients but it is challenging when occasionally a medication name and dose is entered into PYXIS that does not match the actual medication pulled.” (P4)
- “Link eMAR to PYXIS.” (P5)

- “By taking the medication only from the appropriate bin/drawer, which is designated on the screen.” (P6)

Question 7: How long have you been using this system? Have you used it before?

- “Since activated here at MMC, probably 2 years. I did use one when I did a summer interim at a different hospital for a short time.” (P1)
- “About 1.5 years. No.” (P2)
- “Over a year.” (P3)
- “Since implemented at MMC and yes.” (P4)
- “One year, no.” (P5)
- “10 months. Never used it before that.” (P6)

Question 8: How has the PYXIS system helped with your time management techniques?

- “I believe I am able to retrieve the meds I need in a timely fashion. Multiple meds are available quickly. I usually no longer have to wait for pharmacy to bring the meds I need.” (P1)
- “It doesn't really change anything.” (P2)
- “It's fast and efficient when the drugs are present.” (P3)
- “No change.” (P4)
- “PYXIS wasn't used at my other facilities, obtaining drugs have been different for every employer.” (P5)
- “Planning ahead for medication administration times so I can get to the PYXIS to pull meds before admin times.” (P6)

Question 9: What is your satisfaction level with the new PYXIS system?

- “I am very satisfied with the PYXIS capabilities.” (P1)
- “It is nice to have.” (P2)
- “I like it.” (P3)
- “It would be better if it was profiled.” (P4)
- “Satisfactory.” (P5)
- “I think it is overall quite high.” (P6)

Question 10: If there were any changes that need to be done to the system, what would they be?

- “When we have a code or other emergencies where time is of the essence, I find the PYXIS to slow me down.” (P1)
- “NO.” (Emphasis from the respondent.) (P2)
- “I would like to find drug compatibility more efficiently.” (P3)
- “Profile patient medications.” (P4)
- “Link eMAR to PYXIS.” (P5)
- “A way to profile the meds so the patient med list is in PYXIS to select meds from.” (P6)

Four in-person interviews were conducted by me 1 year after the implementation. The persons interviewed were with the head pharmacy, pharmacy technicians, and the director of nursing. They were asked to answer questions to identify issues with implementing and working directly with the PYXIS system. Eight questions were asked of these individuals (see appendix E). The questions and answers are reported below.

Question 1: How do you think the implementation of the PYXIS system is working?

- "I think it's pretty set; a lot of bugs were worked out. A learning curve for the nurses but going smooth now." (P1)
- "It's working very well." (P2)
- "Fine. It works most of the time." (P3)
- "As of today, it is working well; it had its moments during the implementation phase. Medication errors are still occurring, PYXIS will not prevent it. The PYXIS will give you what you ask for. We were seeing 5 to 6 med errors a month. Down to 0 to 1 errors, mostly human error. Nothing to do with PYXIS." (P4)

Question 2: What kind of challenges did you face during the implementation of this system?

- "Getting the staff all comfortable learning it up to the level they needed to be. A huge process moving from all paper. Time wise a big change challenge to make it a good workflow. Pulling each med out for each patient. Working the bugs out as far as registering the patient and getting them in the system. Using for 6 months until charging came out of PYXIS. Initially it wasn't set up. People need to be more precise on what they are choosing so credit can be given." (P1)
- "The biggest challenge was the implementation of the scanning process. Everything needed to be bar coded. It all needed to be in the system and the bar codes matched. Nurses would call to say what is or isn't scanning." (P2)
- "No one knew about the system before it came here." (P3)

- "Selection and location, remodeling the location to adapt to the need of the PYXIS." (P4)

Question 3: How satisfied are you with the PYXIS system?

- "On a 0-10 scale about a 7 to 8, more an 8; it has improved the med administration. PYXIS I not profiled on purpose on pharmacy side. If order not in for the patient, there are both advantages and disadvantages, both ways. I like it a lot better than I thought I would. All staff members have access now." (P1)
- "I love it. Basically it's a pharmacy on the floor; it relieves a lot of work for us. No cart fills, no antibiotics. PYXIS relieved us from a lot of menial work." (P2)
- "It simplifies things. Makes it easier than the carts that were used. It's more secure. Easier for inventory." (P3)
- "From my perspective, I am satisfied; I think it is doing what it was intended to do." (P4)

Question 4: What benefits or problems did the hospital experience from the PYXIS implementation?

- "Answered prior. Improved method of charging and tracking of inventory and usage of different things. Made staff more accountable for what they are pulling and less waste. Better processes of reconstitution of meds. With the EMR, the doctors have to stop ordering off formulary. They need to order what is in PYXIS. Nursing access to pharmacy has decreased. Only a few times a nurse needs to go to pharmacy to get meds. PYXIS lets them stock a majority of the meds. Problems – people may not have been too sure of the change." (P1)

- "Benefits: we have been able to cut back on hours in the pharmacy. No pharmacists on the weekends and fewer full time employees on staff. Problem when the pharmacy is not open and the doc has to order what is in PYXIS or staff need to come to pharmacy to get what they need." (P2)
- "We captured more charges, patient safety, and nurses have the right stuff and the right order." (P3)
- "A benefit was to charge for the drug. Not missing changes. Control of saline flushes. Capturing charges. Eliminated the backup closets. They were losing a lot of the take home meds that were not being billed for. Downfall is in the ER; ACLS drugs were not readily available and nurses needed to do a work around to get to the drugs. Unsure of the system for this currently. They may have meds on other carts in the ER. Surgery and anesthesia charges are being captured more. Anesthesia providers were the most resist to the change and now their activity is being tracked better." (P4)

Question 5: How do you think the PYXIS system affected medication errors?

- "Saw a change in med errors and the type of error that occurred. Some errors may not have been caught without PYXIS. What was pulled would have been caught if not right. Probably had a decrease in med errors. Initially had a spike and now it's down. If a step is skipped, the medication error can go up." (P1)
- "Moved errors from one type, e.g., pulling the wrong product, to now ordering the wrong product in the system. Sometimes the scanner won't work and pharmacy gets calls that the product won't scan. Changed the types and ways the errors

occur but it has helped. Scanning is now involved. The electronic health record is not set up with PYXIS." (P2)

- "I think it captures them more. Nurses scan when they use the electronic medication administration record. We can tell when they take out the wrong strength and put it back." (P3)
- "No impact from my perspective." (P4)

Question 6: What lessons were learned with the implementation of the PYXIS machine?

- "Maybe have a return bin or a process in place for staff on what to do with the medication. Stressing to the staff members to follow the protocols; that's very important." (P1)
- "PYXIS product representatives said everything needed to be hand written and eliminated things that were in excess. It took 4 months to clean up the formulary that was done. Eliminating products we don't have anymore. The entire wheel needed to be created instead of having an example. Clean up is still occurring over a year later." (P2)
- "Charge administration. The electronic health record and charging. Communication and training, ongoing training and communication are needed. Took inventory function away from them." (P3)
- "A revelation of how much revenue was lost not intentionally, but it was lost." (P4)

Question 7: What types of changes are needed to improve the PYXIS system?

- "On the nursing side, there are still issues with a medication that runs out over the weekend. And the patient would miss the dose for example of Vitamin C. Monitoring of stock in the PYXIS machine. When med is entered in the PYXIS it needs to be entered in a consistent manner. Need to make sure to look for both generic and name brand meds. Some couldn't be found for a while." (P1)
- "PYXIS works real well. I came from hospital that has Omni cell – narcs candy dispensing machine. One syringe came out and not picking a syringe out of the whole stock in the drawer." (P2)
- "Maybe if one med is in two different drawers it should be listed. Some way to make it more obvious." (P3)
- "I don't know." (P4)

Question 8: How does the PYXIS system affect your daily routine?

- "Need to plan ahead for med pass a little better if several meds need to be pulled. It does slow you down a little bit. Another nurse may need to pull med so nurse can stay at bedside. It is a little more time consuming than sifting through the drawer." (P1)
- "Basically, relieved from cart fills. IV antibiotic compounding. If there was no label on vial or the medication was discontinued from the patient profile in the EMR, the medication was not brought back to the pharmacy. Instead, it was labeled on the nursing unit. In turn this new process relieved a majority of pharmacy duties. However, keeping PYXIS filled is still one part of the process that needs to be done yet." (P2)

- "It makes my day go faster. We need to fill the PYXIS only twice now. No more going to the stock cart for nights. All the meds are in the PYXIS." (P3)
- "Not at all. Only in a great while if help is needed within the units." (P4)

Discussion of Survey and Interview Themes

The first survey was sent out after the first few months of the implementation of PYXIS. This survey revealed some common themes such as some of the medications were not stocked when the staff needed them. It was not easy to remember the time the medication was administered. The PYXIS machine did help some of the nurses with the five identifiers. Problems found were:

- The brand name and the generic names were not used in the PYXIS and the right dose of the pill was not correctly written and transcribed into the PYXIS.
- Most individuals were not able to pick up medication errors with the new system.
- The system was easy to learn. Most individuals have used this type of system before.
- The pharmacy needed to make sure the PYXIS machine was stocked with the needed medication.

With the second survey that was distributed a year after the implementation of PYXIS there were also common themes presented. These themes were:

- Most individuals did not think there were any challenges with the PYXIS machine.
- The staff felt that there really were not any differences in their charting.

- The EMR was considered by the nurses to be the biggest change with how charting was completed.
- The staff did not feel the PYXIS machine helped with the five patient identifiers; the nurse still needed to double check everything.
- The confidence level of the nurses had either increased or stayed the same with the medication retrieval process.
- Most participants of the second survey felt the medication errors had decreased since the implementation of PYXIS.
- Participants suggested that medication errors could be prevented by double checking the medication that was pulled from PYXIS and making sure it was the correct medication and dose.
- The PYXIS machine did not really help with time management. The nurses just needed to plan ahead regarding when they would be able to get the medications from the machine before they were due to the patient.
- Five of the six nurse participants were satisfied with the machine. "Staff felt the AMDC system was working well and most of the kinks were worked out."
- Most participants thought that a change to profiling the EMR to the PYXIS machine would be a good change for the whole system.

According to the individuals questioned in face-to-face interviews, there was an improvement with the system in the medication passes. Some of the common themes from these interviews were:

- The implementation of the system was working well; however, it took a little while to work the "bugs" out.
- The system was a big change from all paper to paperless and the machine needed to be put in an area that was accessible for all staff nurses so they would have a satisfactory workflow.
- All four participants felt the PYXIS system was an improvement because of the efficiency the system brought to the facility. The inventory could be tracked better and the medications were available on the nursing unit at all times.
- The benefits mentioned by the interviewees were that the PYXIS machine was able to track the charges more efficiently.
- Medication errors were captured, especially in the initial implementation of the system.

Lessons learned from this process change were the realization that many charges were previously lost, a new process was needed for return of medications to the PYXIS, and that each of the codes on each of the medications needed to be changed for the bar-code-scanner to work. Challenges at this point in the process were mostly on the nursing side and consisted of the pharmacy not being available during the weekend and medications not being stocked in the PYXIS. The PYXIS machine affected the daily routine of some individuals in that the pharmacy no longer needed to spend as much time on the nursing units. Nurses needed to plan ahead and manage their time appropriately to

obtain the correct medications from the machine so that they would be available at the correct administration time.

Staff nurses, the CNO, the pharmacist, and the pharmacy techs agreed that the implementation of the PYXIS was an improvement to the facility. The PYXIS machine was helpful with tracking what medication was taken out of the machine and knowing what was administered to the patient. Errors could be identified so they can be prevented in the future. The PYXIS machine has left the majority of the individuals satisfied with what the machine has to offer. With the changes at this facility, the medications were more secure and more medication charges are captured. The facility is running more efficiently with the PYXIS implementation.

Medication Errors

The medication error results from 4 months before implementation (January 1, 2013, to April 2013), and 6 months during and post implementation (May 2013 to October 2014) were collected from of the AMDC implementation. The findings did not show a significant drop in errors. The Chi-square statistic is 2.75. The P value is 0.097254. This result is *not* significant at $p < 0.05$. In fact, after the implementation of the PYXIS, there was an increase in the number of reported error incidences due to the ability to track the errors accurately.

There were 8 medications errors before implementation and 24 medication errors reported during and post implementation. That's a 40% increase in errors. However, both before and after implementation, there are some months when no medication errors were reported. The medication errors per month and the type of error that occurred were

collected (see Figures 1, 2, and 3). The most frequent error types during and post implementation were the wrong frequency or dose was administered (10 errors) or the medication was either delayed or not administered (12 errors). There were a total of 24 errors that were identified during and post implementation and of these 24 errors 22 of them were in these two categories. This is 92% of where the errors occurred during these times. The staff members are currently working on ways to improve the medication administration process. They are doing this by tracking the errors, talking with pharmacist, summarizing the errors by type, and formulating plans for keeping the drawers filled, having a variety of medications stocked, transcribing the physician orders and reminding the staff to triple check their orders.

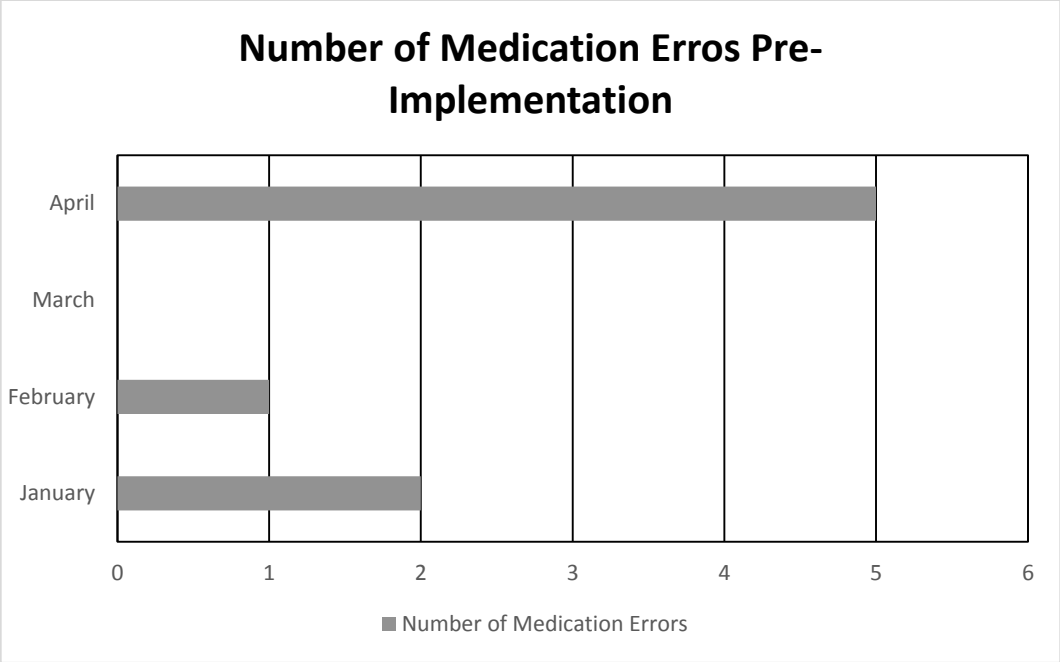

Figure 1. Number of medication errors pre-implementation.

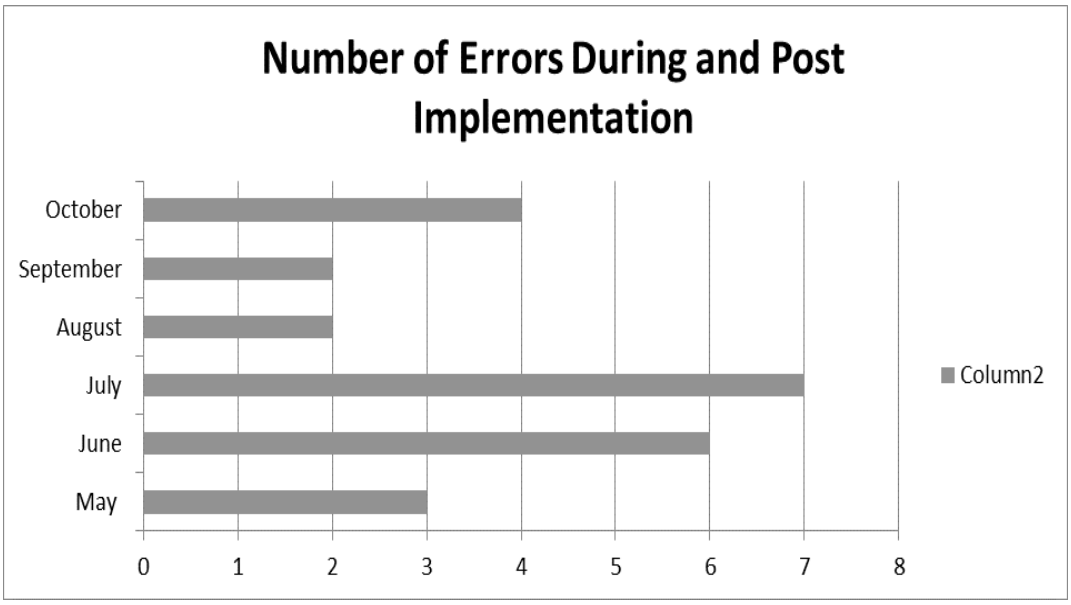

Figure 2. Number of medication errors during and post implementation.

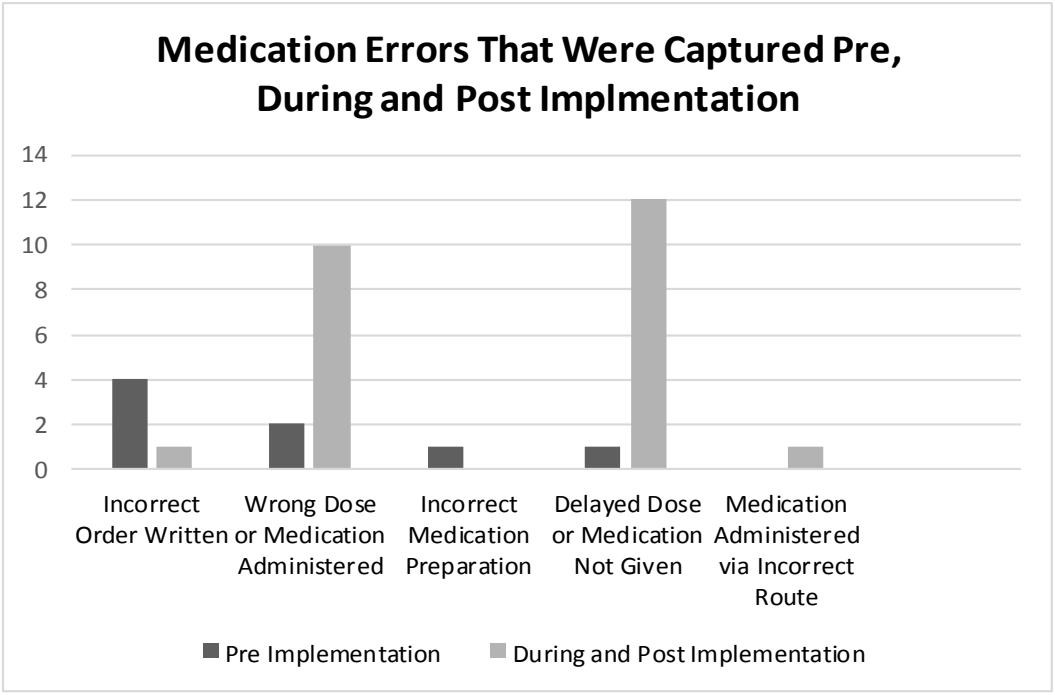

Figure 3. Medication errors that were captured pre, during, and post implementation.

Findings in the Context of the Social Cognitive Theory

Identifying how a nurse performs a medication pass can help to recognize where changes may be needed or where an error may occur. The social cognitive theory was very helpful in the evaluation and implementation of this project. This theory promotes examining an organization as a whole to identify how to create new goals and programs, using both equipment and new ideas (Hodges & Videto, 2011). Identifying how the nurses performed their medication pass before implementation and after the implementation of an AMDC put this theory into use. Now the stakeholders (nurses, the CNO, and the pharmacists/pharmacy techs) know what areas need to improve, how the AMDC product is working, and how the staff members feel about the implementation process.

Findings in the Context of the Literature

The purpose of this project was to conduct a process evaluation of the implementation of an AMDC and associated policies and procedures in a critical access hospital. This project also tracked the different medication errors that occurred over a 15-month time period, and gathered ideas and opinions from staff and management personnel regarding the change to the AMDC. A key component of the evaluation was to identify if medication errors were prevented by using an AMDC. There was an increase in medication errors after the implementation of the AMDC. These errors have occurred due to staff not knowing how to use the new system; staff members were accustomed to having the right dose of medication bundled in one package, which is a typical finding. Now all the doses come in single packages and calculations need to be completed to

determine what dose is required. Other errors were prescribing orders, where the physician wrote an order and it was misinterpreted by the pharmacy or nursing staff. Errors that have occurred were also due to pharmacy not being available 24 hours a day 7 days a week. When the AMDC was not fully stocked with a specific medication and a patient was admitted after pharmacy hours, the machine either ran out of a medication or the medication was not even stocked, and the nurse would have to go to pharmacy to obtain the medication or the patient might not have received the medication until the pharmacy reopened. These errors show that the AMDC does not help prevent medication errors, but it can easily identify or create them if the staff members are not careful. The problems that have been identified are more of a systems problem, and are not really related to the use of the AMDC.

With the new system, the pharmacy and nursing staff know when and what medication was pulled from the machine. With this new technology the medication errors are not based on reported errors only; rather, information on errors is available in real-time showing what medication was pulled and possibly given or not given to the patient. With the new AMDC that is pointing out more of the medication errors and corrective actions in place, this facility is well on their way to creating a safer environment for their patients. The medication errors that occur will be tracked in the future with the use of the AMDC, the pharmacy, and the nurses to continue to refine the system.

The review of the literature that I completed for this project found that safe medication delivery involved an AMDC, which is useful for safekeeping of medication,

convenience, and an improved method of tracking medications (Fung, 2009). The literature that I found reported that together with the use of additional tools, medication errors could be prevented. For example, an EMR that profiles each patient's medications to the AMDC and bar code scanners can help to reduce medication errors. This facility is using all of these technologies with the exception that the EMR does not profile each of the patient's medications to the AMDC. When the EMR does not link up to the AMDC, the specific orders for each patient are not loaded into the AMDC, and there is just a list of all the medications that are in the machine and the nurse needs to know what to choose and administer to the patient. This can create medication errors when the nurse does not choose the right medication and scans the medication with the bar code scanner anyway.

Similar projects and on AMDC implementation that I found recognized that the medication errors did increase upon implementation (Fund & Leung, 2009). After an implementation of an AMDC, there was an increase in reports of medication errors that were made by these cabinets (Fung & Leung, 2009). Increased errors did occur in this small facility where my project took place and is something that may be an expected outcome due to the inexperience of the staff members in use of the machine. Paparella (2006) found that the AMDC does help with organization of medication, which can be a safety mechanism but these machines are not known to contribution significantly to reducing medication errors and may increase the amount of medication errors that occur. The survey participants and the interviewees from my project had felt that the machine did not help prevent medication errors but that it did secure the medications and reported errors easily.

Strengths and Limitations of the Project

The most noteworthy strength of this project was the involvement of the Chief Nursing Officer who knew what this project entailed and how the results would provide good information to the facility. Also, the staff members who participated in the interviews and responded to the surveys were supportive in identifying how the current system is working and how it worked in the past. The collection of medication errors has proven to be a strength of this project because it has shown the types and numbers of errors that occurred before, during, and after implementation of an AMDC.

As with any project, there are some limitations to the project and changes are recommended to others who might conduct a similar evaluation. A primary limitation was the lack of full participation of the nursing staff. With the small number of surveys completed, only a small portion of the potential information was collected. Having another individual instead of the CNO help assist in collection and analysis of the data would have been helpful and less time consuming. The CNO was gracious enough to take the time out of their day to help identify who would be good to interview and was kind enough to be interviewed themselves. What could have been done differently would be to have an individual who was also familiar with the facility but didn't have as many responsibilities. This could have been an individual from the nursing unit or even from the pharmacy. At the time of the planning of the project, it seemed that the CNO was the best option for this role. Another weakness for this project was having the CNO select individuals for the interviews, this does not allow every individual the chance to provide their input.

Because this project took place in a small community hospital of only 25 beds and total of 25 staff members, there were only a limited number of persons who contributed to these results. Limitations of completing a project like this in a critical access hospital were the small number of medication errors that were collected and the small number of participants. The limitation of this project that was due to the lack of participation from the staff was that insight was lost on how all the entire staff felt about the new process. There were a total of 25 staff members who could have participated and there were only five (first survey) or six (second survey) who did participate. Nearly every staff member needed to complete the surveys to help better understand the perceptions of the nurses regarding the new AMDC. More feedback would have benefited this project and the facility. However, the contributions the small number of staff members provided about the AMDC still offered some insight into problems and informed changes to the current medication administration process to improve patient care and safety.

Implications and Recommendations for Nursing Practice, Research, and Other Critical Access Hospitals

Suggestions for future projects conducted at a critical access hospital would be to stay in contact with the staff, especially the head personnel within the facility to keep the resources available when needed. Having a meet and greet with the staff may have been helpful so the staff would have been more familiar with the researcher and they may have been more inclined to participate.

These types of changes for implementation of the new equipment such as the PYXIS, the bar-code scanner, and the electronic health record are necessary to change

with the times and maintain an accurate record of the care delivered. With the tracking of information, errors can be corrected based on what has occurred.

Future studies can build upon the results of this project. Studies can be conducted to see if medication errors are easily identified with an AMDC and if there is enough information documented to conduct root cause analyzes to make targeted system changes. Another useful study would be to compare the types of AMDCs that are available and their benefits and issues for small critical access hospitals. Knowing the pros and cons of each of the different machines may help identify the best product for small hospitals.

The primary recommendation for future research in critical access hospitals would be to obtain nearly 100% of the staff members' involvement. With more nursing staff input, this project would have arrived at more concrete and generalizable results. With only 20% involvement of the nurses, this project produced a weak understanding of all the nurses' perceptions about the implementation of the AMDC. With the small scale of the critical access hospital, this project needed to better engage the nurses in the evaluation of the change and its outcomes. Several lessons were learned from this project that can be translated to other critical access hospitals that are considering or implementing an AMDC system. One of the lessons learned was to collaborate with nursing staff, management, and even maintenance to find a good location for the machine so that it will best augment the nurses' work flow. Additional short-term staff may be needed in the pharmacy to help with the medication code change over. If it is possible, the next facility would benefit from having a pharmacy available 24 hours a day 7 days a week, especially during the early implementation period, so the orders are always be put

into the system by the pharmacy staff and not the nursing staff. Having pharmacy personnel available at all times will help ensure that the PYXIS machine is loaded with all the correct medications for each new patient admitted.

Critical access hospitals should anticipate issues with implementation of an AMCD that are not seen in larger hospital settings, including

- Need for increased pharmacy hours, including weekend and evening coverage.
- Need for ACLS medications to be stocked in the cabinet for emergency treatments or a work around process developed.
- Need to coordinate implementation of the AMDC, the EMR, and electronic physician order entry, simultaneously to avoid predictable gaps.
- Need for more than one AMDC due to delays in medication administration when nurses must share one AMDC.
- Need to plan for an update of the formulary.
- Need to enter patient profiles into the system so that patient medications can be prepared by the pharmacy.
- Need to appoint or hire an ongoing project leader to facilitate the overall implementation and troubleshoot problems.

Analysis of Self

This project has helped me to become a better project leader by helping me to understand the efforts it takes to conduct this type of project. I have developed and followed through with a project that consisted of both qualitative and quantitative data collection, analysis of the data, and dissemination of the results to the project

stakeholders. Within this facility, social change has taken place due to the new technology that has been implemented to improve patient safety. The opportunities to work with many different leaders and help with projects within the organization have made me more aware of what needs to take place to obtain a solution for an organizational problem. I have learned that it takes more than one individual to produce positive change within a facility. I was the lead individual for this project; however, there were many individuals from the facility who were invested in the project and contributed to the end result. I have gained a greater appreciation of the involvement of an inter-professional team and how it is needed to make a change project run smoothly. Projects need to be an ongoing event for facilities to improve their processes. I feel that I have gained knowledge that would not have been possible without this project. Project leadership is not an easy task and constant communication along with perseverance play a big role. I now know to always keep these attributes in the forefront to be able to move forward with any future projects or missions.

Summary

Providing the best patient care can be facilitated in many different ways. Preventing medication errors from occurring is one of the many ways to improve patient care. This project has helped identify how an AMDC affects an organization and that an evaluation of any process change is necessary to identify areas for continued improvement and sustainability of the change. With involvement of the staff, this project has provided information to help improve the current system.

This project resulted in the following products:

- Themes generated from the analysis of the qualitative data collected from the two surveys and the 4 in person interviews
- Tables of the type and number of medication errors from 3 months before implementation of the PYXIS machine, 3 months during the implementation process, and 3 months after the implementation. Recommendations for other critical access hospitals planning to implement an AMDC.

This project was the first to describe the process of implementing an AMDC in a critical access hospital. It can serve as a model for anticipated problems and outcomes as similar hospitals adopt the technology. Lessons were learned such as the need to collaborate with nursing staff, management, and even maintenance to find a good location for the machine, ensure there are enough staff to help with the medication code change over in the pharmacy department, and, if it is possible, to have pharmacy availability 24 hours a day 7 days a week. Finally, further collection of data on medication errors and how to make improvements to AMDC implementations must continue for years after implementation. The next section will discuss the scholarly product and a detailed executive summary.

Section 5: Scholarly Product

Introduction

Healthcare is one area that is always changing with new ways and to make improvements and provide an enhanced experience for patients. Not only are there changes for better hospital stay satisfaction, there are changes to provide the utmost safety for the patients.

Executive Summary

This project took place in a small community hospital of 25 beds and a total of 25 staff members. Over a 1-year period of time, this facility used an AMDC to store and dispense medication. Prior to this time, the medication administration was done manually and the pharmacy placed medications in medication carts on a daily basis.

With a foundation in the stage theory of organizational change, this project identified how a process was previously done has and how changes were made time to improve patient care. This theory looks at a behavior that arises from the constant, bidirectional interfaces of people and their environment and how those behaviors affect the people and their surroundings (Hodges & Videto, 2011). With the surveys and interviews, questions were answered regarding satisfaction with the PYXIS system, what improves were necessary for successful implementation of this system, and whether medication errors were decreased with use of the system. These results also may be helpful to other critical access hospitals that are initiating a similar system and can learn from the mistakes that were made and recommendations provided.

Staff members were satisfied with the AMDC that they have in place. At the beginning, there were problems, such as drawers not working, the wrong dose being in the drawer, and the inventory running low or running out. After one year, the problems were about the same; drawers continued to get stuck and there is no help available to open them, medications were not matching with the medication administration record, and not all the medications are available in the AMDC. The pharmacy has tried to keep a close tab on the inventory and does keep a variety of medications in the drawers. With such a small facility; however, it is difficult to have all the specific medications in the drawers for any patient admitted after pharmacy hours. The pharmacy is not open 24 hours a day 7 days a week as is the case in a larger facility. When a patient comes in after the pharmacy is closed and orders are generated, there may not be enough or any of a specific medication stored in the AMDC. When the AMDC runs out of a medication or the medication is not stored in the machine, the charge nurse must leave the bedside to obtain the medication from the pharmacy. Otherwise, the patient may go without the medication until pharmacy is open.

The number of medication errors increased with use of the PYXIS. There were 32 medication errors that were captured from January 2013 to March 2014. From January 2013 to April 2013 when the AMDC was not in use, eight medication errors occurred. This is only 25% of the medication errors that have occurred during this process. The errors fluctuated between no medication errors to approximately two medication errors per month. After implementation of the AMDC, the errors had increased from no medication errors to approximately six medication errors per month. The staff nurses and

CNO are well aware of the increased medication errors and have taken corrective action to resolve the processes that led to these errors. With errors being tracked more accurately, it is anticipated that systems can be changed to reduce errors in the future. Participants and interviewees did not reveal how these errors are being resolved.

I will present this project using the poster presentation available in Appendix F at the small facility where this project was conducted so that the stakeholders will have a good understanding of what is occurring at their facility and what may be helpful for them as they continue to improve the processes related to the PYXIS implementation. With the pharmacy and management personnel are formulating a plan to correct the glitches and prevent the same medication errors from occurring. With the plans in place, this facility is well on their way to becoming a safer healthcare facility for patients.

The products of the project can be found in Appendix G and it includes a table of themes collected through the surveys and the interviews, the number of medication errors tables, the table of types of medication errors, and the list of recommendations for future critical access hospitals planning to implement an AMDC.

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Appendix A: Literature Review Table

Authors	Title	Sample	Setting	Type of study	Main findings
McDowel, S., Ferner, H., & Ferner, R. (2009)	The Pathophysiology of Medication Errors: How and Where They Arise	Over 50 research projects reviewed	Acute Care	Systematic Review	Routing checking the medication before giving it should reduce errors but there is not many projects completed to confirm this. Technology can reduce the rates of counted errors but not save lives.
Care Fusion (2009)	Bay Medical Turns to Secure Automation for Improved OR Supply Management	1 Operating Room and it's processes	Regional referral hospital	RCT of Effects	Improvements were seen in how charges were recorded and finances were saved. The healthcare professionals were also able to take out their supplies and medications with more confidence.
					(table continues)
Care Fusion	Advancing Patient Safety	1 pharmacy and its staff,	Non-profit	RCT of Effects	The study revealed a

(2010)	and Workflow Efficiency Through Automation	unknown number of staff.	acute care facility		decreased turn-around time for order entry, happier staff, and medication refill errors were reduced by 48%.
Cheung, K., Bouy, M., & Smet, P. (2009)	Medication errors: The importance of safe dispensing.	Over 10 Self-reported studies reviewed	Hospitals, acute care	Systematic Review	Even though dispensing errors were low, improvements in pharmacy are still needed.
Compas, C., Hopkins, K. A., & Townsley, E. (2008)	Best practices in implementing and sustaining quality of care. A review of the quality improvement literature.	76 Articles on quality improvement studies, projects and initiatives	Long-Term Care Facilities.	Systematic Review	This article found that long-term care facilities must have an approach that is concise, versatile, and provided by leadership for a program to be implemented and sustained.
					(table continues)
Freund, J. (2008)	Safe prescribing habits: Preventing medication errors in primary care.	Unknown number of observational studies were reviewed	Acute care and Clinical facilities	Meta Analysis	Both physician and other healthcare providers need to be more conscious of what

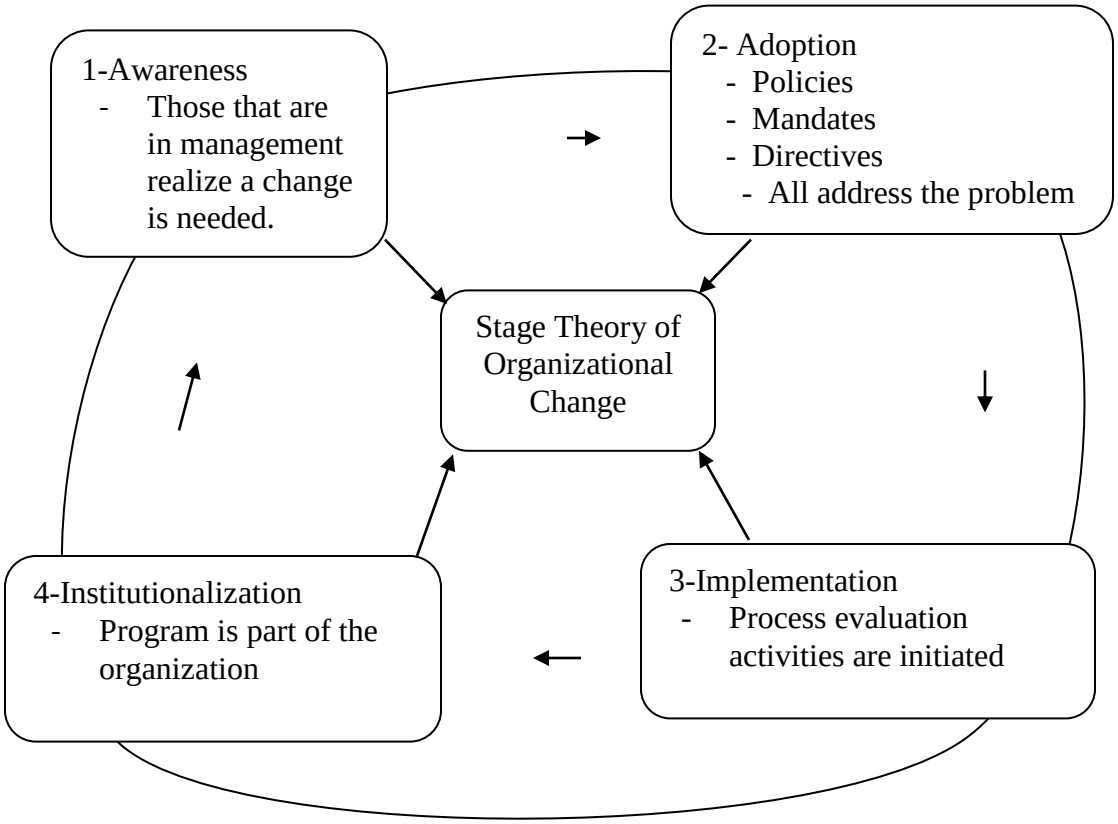
					medication is written, avoid abbreviations, and write legibly.
Grant, D. (2006).	Automated, patient-specific cart fill to improve patient safety.	Improvement Process	Not for profit community hospital	RCT of Effects	The study was to see if implementing technology would help reduce medication errors. This hospital found that just because technology is install it will not warrant a decrease in medication errors. They found that policies and procedures also need to be in place to help prevent medication errors and not technology alone.
					(table continues)
Helmons, P. J., Dalton, A. J., & Daniels, C.	Effects of a direct refill program for automated dispensing	27 automated dispensing cabinets	Acute care areas in a 386-bed	RCT of effects	A redesigned AMDC refill process that includes wholesale

E. (2012).	cabinets on medication-refill errors.		academic medical center		delivery right to the cabinet and bar code medication assistance to help refill will help decrease refill errors.
Wilkinson, D. (2013).	Medication control system reduces errors, adds accountability.	30 nurses initially, then 500 employees	Hospital, acute care	Descriptive Study	This hospital wanted to reduce medication errors and set a goal of 25% and surpassed that considerably. The number that was reached was not provided.
Radley, D., Wasserman, M., Olsho, L., Shoemaker, S., Spranca, M., & Bradshaw, B. (2013).	Reduction in medication errors in hospitals due to adoption of computerized provider order entry systems.	Article from 2006 American of Health-System Pharmacists Annual Survey, the 2007 American Hospital Association Annual Survey & the Latter's 2008 Electronic Health Record	Acute Care	Systematic Review and random-effects meta-analytic techniques	This article found that the computerized physician order entry (CPOE) method decreased medication errors by 48%.

(table continues)

		Adoption Database			
Paperella, S. (2006).	Automated Medication Dispensing System: Not Error Free	Review of the Harris Interactive poll and the Pennsylvania Patient Safety Report System	Acute care, Long term care	Systematic Review	This study found techniques that will help with safe use of an AMDC. The healthcare provided is not to assume that an AMDC will prevent medication errors but they can increase them.
Fung, E., Leung, B. (2009, November)	Do automated dispensing machines improve patient safety?	Review of literature from the University of Health Network in Toronto, Toronto General Hospital, and the ASHP National Survey of Practice in Hospital Settings: dispensing and administratio n.	Acute care	Systematic Review	This article is trying to see is an AMDC helps with patient safety. There are both pro's and con's of an AMDC and for the pro's the AMDC does help with patient safety however in the con's it does help with patient safety but a CPOE and bar coding needs to be in place.

Appendix B: Stage Theory of Organization Change



Stage theory of Organization Change. Adapted from (2011). "Assessment and planning in health programs (2nd ed.)," by B. C., Hodges, and D. M. Videto, 2011, p.157.

Appendix C: Initial Implementation of PYXIS Survey

1. What challenges do you come across with the PYXIS machine?
2. Do you find it easier to remember the time a medication was administered?
3. Does the PYXIS system help you with the five patient identifiers?
4. Are you able to identify any differences between the doctor order and what the order says in the machine?
5. What types of problems have you come across with this system?
6. Are you able to recognize and write out medication errors due to the new system?
7. Has this system been easy to learn?
8. How long have you been using this system? Have you used it before?
9. How has the PYXIS system helped with your time management techniques?
10. Are there any improvements that need to be made to the system, if so please explain?

Appendix D: Post Implementation of PYXIS Survey

1. What challenges do you come across with the PYXIS machine?

2. How does charting differ from previous methods with the use of the PYXIS machine?

3. How does the PYXIS system help you with the five patient identifiers (the right patient, drug, dose, route, and time)?

4. Comparing to before the implementation of PYXIS, how would you explain your confidence level with the medication retrieval now?

5. How often do you think medication errors are occurring after the implementation of PYXIS?

6. If there are medication errors, how can they be prevented using PYXIS?

7. How long have you been using this system? Have you used it before?

8. How has the PYXIS system helped with your time management techniques?

9. What is your satisfaction level with the new PYXIS system?

10. If there were any changes that need to be done to the system, what would they be?

Appendix E: Interview Questions for Management Personnel

1. How do you think the implementation of the PYXIS system is working?
2. What kind of challenges did you face during the implementation of this system?
3. How satisfied are you with the PYXIS system?
4. What benefits or problems did the hospital experience from the PYXIS implementation?
5. How do you think the PYXIS system affected medication errors?
6. What lessons were learned with the implementation of the PYXIS machine?
7. What types of changes are needed to improve the PYXIS system?
8. How does the PYXIS system affect your daily routine?

Appendix F: Poster Presentation

Automated Medication Dispensing Cabinet and Medication Errors

Marie Walsh MSN, RN

Problem

Medication errors can cause significant harm to patients, additional hospital days, and a larger financial burden for both the hospital and the patient (Radley et al., 2013). Not many studies or projects have focused on how a medication dispensing cabinet (AMDC) prevents medication errors where the machine is the main focus of the study. With an estimate of 380,000 preventable adverse drug events recorded each year in hospitals, there are another 450,000 medication errors that are not accounted for (Institute of Medicine [IOM], 2006).

Purpose

The purpose of this project was to conduct a process evaluation of the implementation of an AMDC and associated policies and procedures in a critical access hospital. Implementing a process evaluation project like this is important for healthcare because it will identify the particular challenges of implementing the mandates of the Affordable Care Act of 2010 in a small critical care hospital with limited resources both human and financial.

Project Questions

1. Does implementing an AMDC prevent medication errors?
2. Was the change process to implement an AMDC successful?
3. What are lessons learned in the process of implementation of the AMDC for other critical care access hospitals?

Relevant Literature

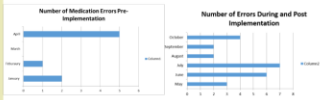
- Research has focused on identifying medication errors in healthcare facilities. Table 1 presents characteristics of the studies included in this a literature review. Sorelle (2000) reported that medical errors occur in thousands of lives every year. The Lancet (2011) reported the cost of medical errors across the nation was $17.1 billion in 2008. "More than one in six prescribing errors involved miscalculation of dose, wrong decimal point placement, incorrect expression of unit of measurement, or an incorrect medication administration rate" (McDowel, Ferner, & Ferner, 2009, p. 3). It is a high priority for healthcare facilities to reduce the number of medical errors and improve patient safety. The number of deaths due to medical errors can range anywhere from 44,000 to 98,000 individuals yearly in hospitals (IOM, 2006). Freund (2008) stated that more than 7,000 deaths have taken place yearly due to a number of medication errors. With this number of deaths occurring due to medication errors, length of stay in the hospital would also be longer due to the detrimental reaction to the medication that had reached the patient.

Data Analysis

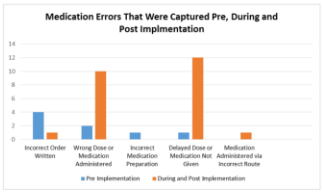
- Results from interviews and surveys were analyzed
- Medication errors were defined and identified with descriptive data

Findings

- Medication errors are not prevented using an AMDC but they do help identify the errors that occur.



- The number of medication errors pre and post implementation of the AMDC are listed here.



- Number of and types of medication errors help identify what area the majority of errors occur.

Limitations

- Small number of medication errors that were collected.
- Small sample size

Conclusions

This project has helped identify how an AMDC affects an organization and that an evaluation of any process change is necessary to identify areas for continued improvement and sustainability of the change. With even the small involvement of the staff, this project has provided information to help improve the current system. Further collection of data on medication errors and how to make improvements to AMDC implementations must continue for years after implementation.

Social Change Implications

Social change in practice has taken place with this project due to the verity that new technology was implemented at a small hospital. While this change is expected to create a safer patient environment and improved satisfaction of healthcare employees, the process evaluation has uncovered areas of improvement.

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A higher degree. A higher purpose.

Appendix G: Themes, Medication Errors and Recommendations

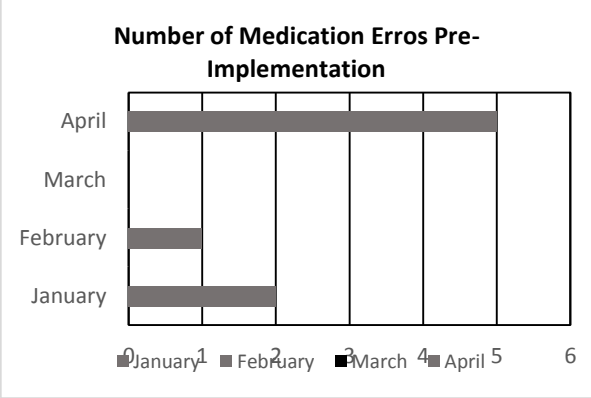
Survey themes pre and post-implementation	Interview themes post-implementation
• The brand name and the generic names were not used in the PYXIS and the right dose of the pill was not correctly written and transcribed into the PYXIS. • Most individuals were not able to pick up medication errors with the new system. • The system was easy to learn. Most individuals have used this type of system before. • The pharmacy needed to make sure the PYXIS machine was stocked with the needed medication. • Most individuals did not think there were any challenges with the PYXIS machine. • The staff felt that there really were not any differences in their charting. • The EMR was considered by the nurses to be the biggest change with how charting was completed. • The staff did not feel the PYXIS machine helped with the five patient identifiers; the nurse still needed to double check everything. • The confidence level of the nurses had either increased or stayed the same with the medication retrieval process. • Most participants of the second survey felt the medication errors had decreased since the implementation of PYXIS. • Participants suggested that medication errors could be prevented by double checking the medication that was pulled from PYXIS and making sure it was the correct medication and dose. • The PYXIS machine did not really help with time management. The nurses just needed to plan (Table continues) ahead regarding when they would be able to get the medications from the machine before	• The implementation of the system was working well; however, it took a little while to work the "bugs" out. • The system was a big change from all paper to paperless and the machine needed to be put in an area that was accessible for all staff nurses so they would have a satisfactory workflow. • All four participants felt the PYXIS system was an improvement because of the efficiency the system brought to the facility. The inventory could be tracked better and the medications were available on the nursing unit at all times. • The benefits mentioned by the interviewees were that the PYXIS machine was able to track the charges more efficiently. • Medication errors were captured, especially in the initial implementation of the system.

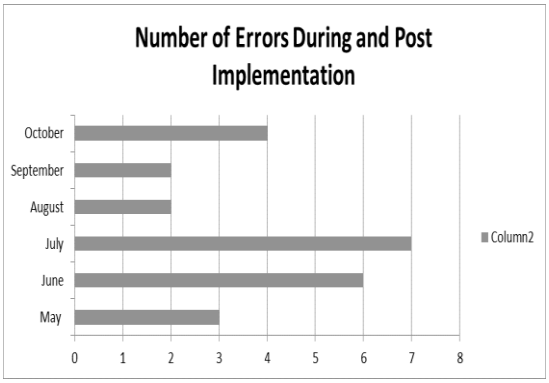
(table continues)

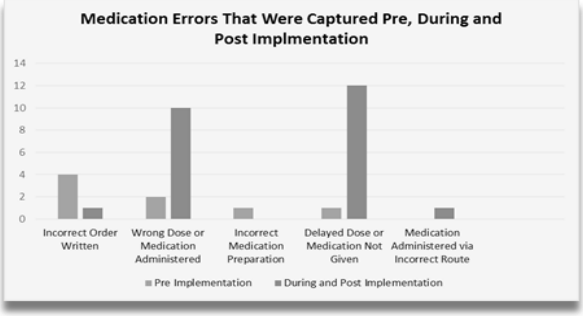
they were due to the patient.

- Five of the six nurse participants were satisfied with the machine. "Staff felt the AMDC system was working well and most of the kinks were worked out."
- Most participants thought that a change to profiling the EMR to the PYXIS machine would be a good change for the whole system.

(table continues)







Recommendations for Critical Access Hospitals

- Need for increased pharmacy hours, including weekend and evening coverage.
- Need for ACLS medications to be stocked in the cabinet for emergency treatments or a work around process developed.
- Need to coordinate implementation of the AMDC, the EMR, and electronic physician order entry, simultaneously to avoid predictable gaps.
- Need for more than one AMDC due to delays in medication administration when nurses must share one AMDC.
- Need to plan for an update of the formulary.
- Need to enter patient profiles into the system so that patient medications can be prepared by the pharmacy.

(table continues)

• Need to appoint or hire an ongoing project leader to facilitate the overall implementation and troubleshoot problems.	• Stay in contact with all the involved staff

Curriculum Vitae

Marie Walsh, MSN, RN CARN

Skills and Abilities

♦ Educate in classroom and virtually
♦ Research and organize information in medical records.
♦ Explain hospital procedure and disease processes.
♦ Effective oral and written communication due to charge nurse role within the floor.
♦ Knowledge of Blackboard and Angel classrooms
♦ Advanced use of Word and Power Point.
♦ Knowledge of Adobe connect

Work Experience

Rasmussen College ♦ *Wausau, WI* ♦ 7/2012 *to Current*
Full-Time Nursing Instructor
♦ Supervise nursing students in their clinical rotation
♦ Teach new nursing techniques and skills
♦ Assist student with the fundamentals of nursing
♦ Educate and assist students in the residential and on-line environments

Chamberlain College ♦ *USA - Virtual* ♦ 10/2013 *to Current*
Adjunct Nursing Instructor
♦ Supervise and instruct nursing students in their online discussions
♦ Provide advice on nursing techniques and skills
♦ Educate and assist students with Pathophysiology II

Bard Medical ♦ *Travel* ♦ *6/2011 to Current*
Clinical Nurse Educator
♦ Conduct education and in-service training
♦ In-person training on the nursing floor to the staff
♦ Work autonomously educating staff in various areas

MSTC ♦ *Wausau, WI* ♦ 8/2012 *to 1/2014*
Adjunct Certified Nursing Assistant Instructor
♦ Supervise certified nursing assistant students in their class and clinical rotations
♦ Teach CNA techniques to students
♦ Assist students to be prepared for hospital patients

♦ Educate and assist students with the Human Body in Heath and Disease class

Saint Joseph's Hospital. ♦ *Marshfield, WI* ♦ 4/*2009 to 6/2013*
Registered Nurse-floor and charge nursing
♦ Safely administer medications to patients for medical detoxification
♦ Start IV's and maintain fluids
♦ Responsible for staffing the next shift.
♦ Training of new nursing personnel.
♦ Manage a team of 8-10 patients

Nurse PRN ♦ *Wausau, WI* ♦ *3/2007 to 7/2008*
License Practical Nursing
♦ Manage teams of 30-40 patients
♦ Perform tube feeding skills, safe nebulizer and med passes
♦ Travel between multiple long term facilities in the central WI area

Saint Joseph's Hospital. ♦ *Marshfield, WI* ♦ *2005 to 4/2009*
License Practical Nursing
♦ Safely administer medications to patients for medical detoxification
♦ Start IV's and maintain fluids
♦ Manage a team of 8-10 patients

Education

Walden University ♦ *Online* ♦ 9/4/*2012 to 2/28/2015*
♦DNP-General

Walden University ♦ *Online* ♦ completed- *8/19/2012*
♦MSN-Education

Kaplan Continuing Education ♦ *Online* ♦ completed- 3/*2011*
♦ Legal Nurse Consulting Certificate

Chamberlain College ♦ *Online* ♦ completed- 10/*2010*
♦ Bachelor of Science in Nursing

North Central Technical College ♦ *Wausau* ♦ completed- 12/*2008*
♦ Associates Degree in Nursing

Mid-State Technical College ♦ *Wisconsin Rapids* ♦ completed- 12/*2005*
♦ Licensed Practical Nurse Diploma

Professional Organizations

♦ American Association of Legal Nurse Consultants (2011)
♦ National League for Nursing (2012)
♦ The Honor Society of Nursing, Sigma Theta Tau International (2012)
♦ National Student Nurse Association (2014)
♦ American Nurses Association (2014)

Volunteerism

After School Bowling ♦ *Volunteer* ♦ *Marshfield, WI* ♦ 1998 -*2000*
Red Cross ♦ *Volunteer* ♦ *Marshfield, WI* ♦ *8/2012*
Career Closet ♦ *Volunteer* ♦ *Wausau, WI* ♦ *8/2012-Present*