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Improving Medication Administration Safety in a Correctional Facility with an Electronic Medication Administration System

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School of Nursing and Health Professions, University of San Francisco

NURS 670: Practicum Internship

Professor Robin Jackson, RN, MSN, CNL

August 3, 2021

Improving Medication Administration Safety in a Correctional Facility with an Electronic Medication Administration System

Abstract

Problem: According to the World Health Organization (2020), medication errors are one of the leading causes of injury and avoidable harm in health care globally.

Context: The county jail houses approximately 700 inmates/patients on a daily basis, and the potential for error when administering medications is high as medications are prepared manually using a paper medication administration record.

Interventions: The jail began using an electronic health record/barcode administration system on October 19, 2020.

Measures: Unusual occurrence reports related to medication errors were reviewed. The timeframe included 6 months before electronic implementation, and 6 months after implementation.

Results: Unusual occurrence reports due to medication error were reduced 88.9% after the implementation of the electronic health record/barcode medication administration system.

Conclusion: Medication administration safety has improved dramatically at the jail as a result of implementing updated and current electronic technology. Administering medications in a locked correctional facility takes place in coordination with other scheduled inmate activities, as well as the security issues associated with the inmates, nonetheless medication safety improvement needs to continue to be a focus for nurses (Knox, 2015).

Keywords: medication, safety, jail, barcode, electronic

Introduction

Working in a correctional facility is a struggle for nurses as they attempt to accommodate nursing priorities along with security issues. Working in a locked environment makes providing care more difficult than necessary as professional standards, health care policies, and safety issues must be considered. In a correctional setting nurses are the primary health care providers for the inmates, and provide most of the care including but not limited to public health, emergency services, geriatric, mental health, and maternal health care; thus correctional health care is primarily a nurse-driven system (Dhaliwal & Hirst, 2018). Jails and prisons are designed to hold incarcerated inmates, and unfortunately this does not always include effectively preventing easily transmissible diseases or treating chronic medical problems (Ahalt et al., 2013).

In any healthcare setting, medication administration is one of the tasks with the highest potential for error. According to the World Health Organization (2020), medication errors are one of the leading causes of injury and avoidable harm in health care globally. The costs associated with medication errors have been estimated at \$42 billion annually. In the United States, medication errors are estimated to cause harm to approximately 1.5 million patients annually, with 400,000 preventable adverse events related to these mistakes (Agrawal, 2009). According to Chu (2016), barcode assisted medication administration systems, when used appropriately will decrease drug-dosing errors by as much as 90%. Integrating a standardized electronic health record system, as well as a barcode assisted medication administration method to scan the inmate's wrist band before administering medications will help reduce errors by ensuring the five "rights" of medication administration occur: the right patient, the right dose, the right route, and the right time (Chu, 2016).

Problem Description

Providing safe and effective care to the incarcerated population needs to be a priority for all team members. Measuring key metrics such as access and timeliness of care, and safety including the reduction of preventable medication errors and making these metrics accessible to all staff will motivate them to improve those scores (Prentice et al., 2016). The jail clinic does not have a metric data wall as there are no inmate satisfaction surveys done. One key metric that can always be improved on is medication safety. On October 19, 2020, the jail clinic began using an electronic health record system as well as an automated medication dispensing system and using barcode medication administration. This will help improve the safety of medication administration at the jail, as well as save the correctional health department the costs related to hospitalizations and litigation associated with medication errors.

Quality of care depends on the communication and handoffs between staff and all the units involved (Institute for Excellence in Health and Social Systems, 2020). Focus on communication and medication safety will improve the quality of care for the patients currently incarcerated.

Available Knowledge

PICOT Question

For (P) inmates in a county jail, does (I) implementing an electronic medical record systems and standardized barcode medication administration, compared to (C) the current use of paper charting, improve medication safety as measured by the number of unusual occurrence reports submitted to the department manager by April 19, 2021 (T).

Search Strategy

A review of literature was conducted in February 2020, by searching the PubMed, CINAHL, and Cochrane Database of Systematic Reviews databases. The literature review was expanded to a 10-year timeframe as the number of recent (within the last 5 years) results was limited. The articles reviewed included one mixed-method study, one literature review, one systematic search across 10 electronic databases, one narrative review of peer reviewed scientific publications, and one quasi-experimental study (see Appendix A). Using the Johns Hopkins Nursing Research Evaluation Tool, three of the articles chosen were determined to be level V, while one was rated level II.

Rationale

According to the World Health Organization (2020), medication errors remain exceptionally high despite the presence of interventions designed to safeguard patient safety. It is estimated that more than 50% of all medications that are prescribed are either dispensed, administered or used inappropriately. However, this estimate does not take into consideration the rate of errors that are due to underreporting. A major nursing responsibility is maintaining safety while administering medications (Lapkin et al., 2016). Avoiding medication errors requires vigilance and is aided by the use of appropriate technology to help ensure proper procedures are followed. Use of barcode technology improves medication safety and substantially reduces rate of error. Using barcode technology reduces adverse drug events up to 90 % when used correctly. Repeated observations of nurses must be made in order to ensure the system is used correctly without workarounds. Recommendations also include reducing distractions while preparing and administering medications and double checking the medications

and orders before dispensing (Jimenez, 2017; Koppel et al., 2008; Lapkin et al., 2016; Leung et al., 2015; Poon et al., 2010).

Learning theories contribute to the support of any improvement project as they help to lead the strategies that will be used and the framework design for implementation (Khalil & Elkhider, 2016). The theories used to guide this project were the improvement science and systems theory, which focuses on improving quality and safety in healthcare (Institute for Healthcare Improvement, 2021). Lewin's change theory was also used as this theory is based on the steps needed to make that transition.

Specific Project Aim

The specific project aim is to look at how implementing an electronic health record and barcode medication administration system improves medication safety in a correctional facility by looking at data associated with medication errors, and hospitalizations associated with these errors.

Context

The jail clinic is part of a larger county health system. The biggest ethnic populations inside the jail are Latinos and African Americans. The majority of inmates are between 20-50 years old. The most common health care requests are related to dental care, hypertension, diabetes, anxiety, depression, and chronic pain. The length of incarceration varies from a few hours to many years depending on the sentence the inmate has to serve. The health care staff caring for the inmates include physicians, nurse practitioners, psychiatrists, forensic mental health social workers, registered nurses, and vocational nurses. The clinic is staffed 24-hours a day by registered nurses. There are various standardized procedures that provide the staff nurses autonomy when assessing and treating inmates for routine problems.

The Clinical Microsystem Assessment Tool by the Institute for Healthcare Improvement (2021), suggests that improvement can occur in the areas of staff education and training, patient focus, process improvement, and integration of information with staff and patients.

Implementing a new electronic health record/barcode administration system will vastly improve patient safety. The two major strengths of implementing an electronic health record and medication administration system are the reduction in medication errors, and the reduction in the amount of time it takes to manually prepare medications for the inmates (see Appendix B). By improving overall medication administration safety, as well as reducing the possible adverse reactions to the combination of medications that are administered (some inmates receive as many as 10 different medications at a time), lawsuits and possible litigation related to these errors can be avoided (see Appendix C).

Interventions

After many years of using paper medication administration records (MAR's), and having the nurses manually prepare medications for the inmates, a new electronic system was implemented on October 19,2020. The interventions studied are the standardization of having an electronic MAR, the automated medication dispensing system (TALYST), as well as using barcode verification when administering medications. These interventions will improve medication accuracy and safety for the inmates (see Appendix D).

Study of the Interventions

Unusual occurrence reports related to medication errors were obtained from the health services manager, as well as the number of hospitalizations related to these errors. Additionally, any data available on litigation related to medication errors if available was considered.

Measures

The outcomes measured for this project are the number of unusual occurrence reports submitted to the health services manager related to medication errors after six months of implementing the electronic barcode medication administration system, compared to the number of unusual occurrence reports submitted the previous six months. The number of patients referred and admitted to the hospital because of medication errors was compared, as well as any data on litigation costs that is available. Because using a barcode assisted medication administration system appropriately may reduce drug-dosing errors by as much as 90% (Chu, 2016), the goal is to measure if there is any improvement in medication administration safety at the jail clinic.

Ethical Considerations

The Jesuit values that align with the nursing goal of this project are the concepts of social and distributive justice in healthcare, more specifically *cura personalis* and the concept of women, and men for and with others (Creighton University, n.d.). Social and distributive justice in healthcare is important as it aims to allocate and maximize resources, making them available to all as this will benefit society as a whole to obtain better outcomes (Capp et al., 2001). *Cura personalis* emphasizes the importance of being respectful towards all of God's creatures.

Respecting the patient's background and uniqueness in correctional healthcare is important. The

American Nurses Association Code of Ethics (2015) declares that a nurse needs to promote, advocate for, and protect the rights, health, and safety of the patient.

The Belmont report sets forth ethical guidelines for the protection of human subjects in biomedical and behavioral research. The two principles that apply to this project are the respect for persons, and beneficence (U.S. Department of Health & Human Services, 2019). Analyzed reports and data related to medication errors remained anonymous, and nurses on the unit were not reprimanded for reporting such errors. The intention is to improve medication safety at the jail, and nurses and patients involved were treated with respect. There are no conflicts of interest among the clinic nurses or management team. This project has been approved by the University of San Francisco School of Nursing and Health Professions Master of Science in Nursing-Clinical Nurse Leader Degree Program and meets the requirement as a quality improvement project. Per University Policy, no Institutional Review Board (IRB) analysis is needed (see Appendix E).

Methods

Implementing this project required training current staff on how to use the new electronic health record/barcode medication administration system, as well as how to use the automated medication dispensing machines. Implementing these new systems will help improve patient safety and reduce medication administration errors. The two major strengths of implementing an electronic health record and medication administration system are the reduction in medication errors, and the reduction in the amount of time it takes to manually prepare medications for the inmates. By improving overall medication administration safety, as well as reducing the possible adverse reactions to the combination of medications that are administered, lawsuits and possible litigation related to these errors can be avoided. The weaknesses in implementing this new

system are the need to schedule all staff for training within the timeframe allotted, as well as the learning phase which may make the initial days with the new technology result in longer times for medication preparation. Communication needed for implementation included meeting with department supervisors, managers, and nursing staff to share the proposal and discuss specific needs and concerns that can arise, as well as the current operational needs of the health clinic (see Appendix F). The electronic health record and medication administration system went into effect on October 19, 2020 and continues to be improved as new issues arise.

Results

Unusual occurrence reports were reviewed for the 6 months prior to electronic health record/barcode medication administration system implementation. There were a total of 27 unusual occurrence reports related to medication errors filed between April 19, 2020-October 18, 2020. Of these errors, 10 were transcription related, 9 were due to medication delays/medication not given on time, 1 was for medications given to the wrong patient, and 9 were due to other reasons. During this time period there was one patient hospitalized due to a transcription error, when the patient was given more insulin than prescribed.

In the six months following implementation, for the time period of October 19, 2020-April 19, 2021, there were a total of 3 unusual occurrence reports filed due to medication errors. These errors included a missed medication, a patient receiving a double dose of the ordered medication, and a missed dose due to medication unavailability from the pharmacy. For this time period, there were zero hospitalizations reported. In total medication errors were reduced 88.9% during the time period studied. These findings reflect evidence-based recommendations that state that with the appropriate use of an electronic health record/medication barcode administration system, medication errors may be reduced up to 90% (Chu, 2016).

Summary

Medication administration at the county jail was updated by implementing a standardized electronic medical health record and a barcode medication administration system after many years of using an outdated system of paper charting and paper medication administration records. Unusual occurrence reports relating to medication errors were reviewed and compared. The timeframe chosen to review was 6 months before electronic implementation, and 6 months after implementation. Medication errors were reduced 88.9%, from 27 in the 6 months preceding implementation to only 3 being reported 6 months after implementation.

Reducing medication errors is vital to improving patient safety in a correctional facility. Incorporating technology into the medication administration process reduces the potential for human error and provides alerts when there is a potential for an error to occur (McGonigle & Mastrian, 2018). Moving from a paper MAR based system to an electronic system improved accuracy and safety when administering medications to the inmate population.

Conclusion

Implementing an electronic health record/barcode administration system at the jail vastly improved the safety of medication administration for this often overlooked and vulnerable population. The biggest improvement was a reduction in transcription errors. Modifications and updates will continue to be needed as new issues arise and are to be expected, especially within the first year of transitioning from a paper charting method. Increased medication safety reduced the number of reported errors, as well as the number of hospitalizations related to these errors, thus saving the correctional health system additional expense.

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Appendices

Appendix A

Evaluation Table

PICOT Question

How does utilization of an electronic medication administration system improve medication pass safety in a correctional facility setting during the first 6 months of implementation?

Study	Design	Sample	Outcome/Feasibility	Evidence rating
Koppel et al., (2008). Workarounds to barcode medication administration systems: their occurrences, causes, and threats to patient safety. <i>Journal of the American Medical Informatics Association</i>	Mixed-method Study	31 Nurses at five hospitals, with 307,698 medication administrations	Repeated observations of nurses must be made in order to ensure system is used correctly without workarounds. Useful for implementation.	V B
Jimenez, M. (2017). Effects of barcode medication administration: Literature review. <i>Proceedings of the Northeast Business & Economics Association</i>	Literature Review	None	Avoiding medication errors requires vigilance and the use of appropriate technology to help ensure proper procedures are followed. Useful for implementation.	V B
Lapkin et al. (2016). The effectiveness of interventions designed to reduce medication administration errors: A synthesis of findings from systematic reviews. <i>Journal of Nursing Management</i>	Systematic search across 10 electronic databases	Sixteen systematic reviews were eligible for inclusion	Recommendations include reducing distractions while preparing and administering medications and double checking	V B

Study	Design	Sample	Outcome/Feasibility	Evidence rating
Leung et al.(2015). A practice standard for barcode technology. <i>Journal of Patient Safety</i>	Narrative review of peer reviewed scientific publications	75 articles selected for full-text review	Using barcode technology reduces adverse drug events up to 50.8 % when used correctly.	V B
Poon et al.(2010). Effect of bar-code technology on the safety of medication administration. <i>New England Journal of Medicine</i>	before-and-after, quasi-experimental study	14,041 observed medication administrations and review of 3,082 order transcriptions	Use of bar-code/eMAR improves medication safety and substantially reduced rate of error Useful for implementation	II B

Appendix B

SWOT Analysis

<i>STRENGTHS</i>	<i>WEAKNESSES</i>
<ul style="list-style-type: none"> *Fewer medication errors *Faster medication preparation time 	<ul style="list-style-type: none"> *Need for staff training *Initial learning time may make medication preparation time longer
<i>OPPORTUNITIES</i>	<i>THREATS</i>
<ul style="list-style-type: none"> *Adapt to new electronic health technology *Less medication error lawsuits *Improve medication safety * Less risk of adverse reactions due to medication errors 	<ul style="list-style-type: none"> *Cost of training and hardware may not be approved by city council as part of the budget.

Appendix C

Soarian/Talyst System Implementation Annual Savings Projection for 2020 and 2021

	2020	2021
Estimated Litigation Costs	\$275,000	\$0
Cost of Hospitalizations	\$15,000x1= \$15,000	\$0
Projected Annual Savings	\$0	\$290,000

Appendix D

Budget Plan Integration of Electronic Health Record and Medication Administration System

Cost Description	Detail	Year One/Initial Costs	Year Two
Initial nursing staff training	Education for 35 RN's and 12 LVN's RN: \$70/hr x 8.0 hr x 35 RNs = \$19,600 LVN: \$35/hr x 8.0 hr x 12 LVNs = \$3,360 Total of 47 hours	\$22,960	N/A
New Inmate identification bands	700 inmates x \$1.00 each new band = \$700	\$700	N/A
Talyst Medication Dispensing System	Talyst System, 2 machines needed x \$165,000 each = \$330,000	\$330,000	N/A
Laptop Computer	Laptop Computer for Medication Administration \$450 each x 4 = \$1,800	\$1,800	N/A
Barcode Scanner	4 Handheld Scanners \$45 each x 4 = \$180	\$180	N/A

Appendix E

CNL Project: Statement of Non-Research Determination Form

Student Name: Rosalinda Salazar

Title of Project:

How does utilization of an electronic medication administration system improve medication pass safety in a correctional facility setting during the first 6 months of implementation?

Brief Description of Project:

A) Aim Statement: To standardize medication administration at the county jail clinic using a barcode system instead of using paper MAR's.

B) Description of Intervention: To use an electronic barcode medication administration system and EHR when distributing medications to inmates

C) How will this intervention change practice?

Moving from a paper MAR based system to an electronic system will improve accuracy and safety when administering medications to the inmate population.

D) Outcome measurements: Outcome measured will be a decrease in unusual occurrence event reports due to medication errors, as well as a decrease in hospitalization costs associated with these errors.

To qualify as an Evidence-based Change in Practice Project, rather than a Research Project, the criteria outlined in federal guidelines will be used:

(<http://answers.hhs.gov/ohrp/categories/1569>)

This project meets the guidelines for an Evidence-based Change in Practice Project as outlined in the Project Checklist (attached). Student may proceed with implementation.

This project involves research with human subjects and must be submitted for IRB approval before project activity can commence.

Comments:

EVIDENCE-BASED CHANGE OF PRACTICE PROJECT CHECKLIST *

Instructions: Answer YES or NO to each of the following statements:

Project Title:	YES	NO
The aim of the project is to improve the process or delivery of care with established/ accepted standards, or to implement evidence-based change. There is no intention of using the data for research purposes.	X	
The specific aim is to improve performance on a specific service or program and is a part of usual care . ALL participants will receive standard of care.	X	
The project is NOT designed to follow a research design, e.g., hypothesis testing or group comparison, randomization, control groups, prospective comparison groups, cross-sectional, case control). The project does NOT follow a protocol that overrides clinical decision-making.	X	
The project involves implementation of established and tested quality standards and/or systematic monitoring, assessment or evaluation of the organization to ensure that existing quality standards are being met. The project does NOT develop paradigms or untested methods or new untested standards.	X	
The project involves implementation of care practices and interventions that are consensus-based or evidence-based. The project does NOT seek to test an intervention that is beyond current science and experience.	X	
The project is conducted by staff where the project will take place and involves staff who are working at an agency that has an agreement with USF SONHP.	X	
The project has NO funding from federal agencies or research-focused organizations and is not receiving funding for implementation research.	X	
The agency or clinical practice unit agrees that this is a project that will be implemented to improve the process or delivery of care, i.e., not a personal research project that is dependent upon the voluntary participation of colleagues, students and/ or patients.	X	
If there is an intent to, or possibility of publishing your work, you and supervising faculty and the agency oversight committee are comfortable with the following statement in your methods section: <i>“This project was undertaken as an Evidence-based change of practice project at X hospital or agency and as such was not formally supervised by the Institutional Review Board.”</i>	X	

ANSWER KEY: If the answer to **ALL** of these items is yes, the project can be considered an Evidence-based activity that does NOT meet the definition of research. **IRB review is not required. Keep a copy of this checklist in your files.** If the answer to ANY of these questions is **NO**, you must submit for IRB approval.

*Adapted with permission of Elizabeth L. Hohmann, MD, Director and Chair, Partners Human Research Committee, Partners Health System, Boston, MA.

STUDENT NAME (Please print):

Rosalinda Salazar

Signature of Student: Rosalinda Salazar **DATE** 4/19/2021

SUPERVISING FACULTY MEMBER NAME (Please print):

Signature of Supervising Faculty Member

DATE _____

Project Charter and Measurement Strategy

Title: How does utilization of an electronic medication administration system improve medication pass safety in a correctional facility setting during the first 6 months of implementation?

Global Aim: To standardize medication administration at the county jail clinic using a barcode system instead of using paper MAR's.

Specific Aim: To measure if there is any improvement in medication administration using barcode technology by tracking the number of unusual occurrences and hospitalizations related to medication errors during the first 6 months after implementation and comparing that to the prior 6 months.

Background Information/Rationale for project:

Providing safe and effective care to the incarcerated population needs to be a priority for all team members. Measuring key metrics such as access and timeliness of care, and safety including the reduction of preventable medication errors and making these metrics accessible to all staff will motivate them to improve those scores (Prentice et al., 2016). One key metric that can always be improved on is medication safety. On October 19, 2020 the jail clinic began using an electronic health record system as well as a barcode medication administration system.

Using a barcode assisted medication administration system appropriately has the potential to reduce drug-dosing errors by as much as 90% (Chu, 2016). This will help improve the safety of medication administration at the jail, as well as save correctional health costs related to hospitalizations and litigation associated with medication errors.

Sponsors:

Clinical Services Manager II- Nursing	
Clinical Nurse II, Educator/Advocate, Correctional Health Services	

Goals for the project:

To measure and track if there is a reduction in medication administration errors and costs associated with hospitalizations and outside care related to these errors.

Measures:

A count of unusual occurrence reports and tally of errors related to medication administration will be collected from the Correctional Health Nursing Manager, as well as information related to hospitalizations including length of stay and cost.

Team Members:

Correctional Health Services Nursing Manager	Registered Nurses
Clinical Nurse II, Educator/Advocate	Licensed Vocational Nurses

Changes to Test:

- 1) Are the correct medications being administered to the correct patient, at the right time?
- 2) Are the doses administered the correct doses ordered?
- 3) How many unusual occurrence reports have been submitted since the barcode implementation system?

CNL Competencies List

1) Quality Improvement and Safety

Analyze information about medication administration and its implication for quality improvement. Assess the process of medication administration using the newly implemented barcode technology and how it promotes delivery of higher-value care. Promote a culture of continuous quality improvement within the jail system while evaluating medication administration processes to enhance the safety of medication administration.

2) Translating and Integrating Scholarship into Practice

Apply medication safety guidelines to improve nursing practice and the jail care environment, as well as participate and collaborate with other members of the health care team to support policy changes and improve care outcomes.

3) Informatics and Healthcare Technologies

Participate in ongoing evaluation, implementation, and integration of the newly implemented barcode technology and electronic health record system. Collect and evaluate medication administration data to reduce risks and improve health outcomes for the inmate population.

Measurement Strategy

Background (Global Aim) To standardize medication administration at the county jail clinic using a barcode system instead of using paper MAR's.

Population Criteria: Inmates who are currently receiving at least one medication through the nurse administered medication pass.

Data Collection Method: Data will be obtained from unusual occurrence reports submitted to the Correctional Health Services Manager, as well as information on hospitalizations resulting from these errors. Data from the first 6 months after electronic barcode implementation will be compared with data from the previous 6 months.

Data Definitions

Data Element	Definition
Unusual occurrence report	Number of unusual occurrence reports filed to manager related to medication errors
Number of hospitalizations	Number of patients hospitalized or sent to the emergency department after a medication error
Length of hospital stay	Of patients hospitalized after a medication error, number of inpatient days

Measure Description

Measure	Measure Definition	Data Collection source	Goal
Number of unusual occurrence reports related to medication errors	N= number of error reports	Report obtained from Dept. Manager	0
Number of patients sent out to hospital due to medication errors	N= patients needing to be evaluated in ED for medication error D= patients admitted due to medication error	Report obtained from Dept. Manager	0
Total number of average patients receiving medications in a 24 hr period	N= Patients on at least one medication being administered by the floor nurse	Report obtained from Dept. Manager	N/A

Appendix F**Project Timeline- Gantt Chart**

	06/20	07/20	08/20	09/20	10/20
Conduct Microsystem Assessment					
Identify metrics that matter, goal setting					
Select date to implement					
Collect baseline data					
Conduct staff needs assessment					
Schedule Staff Training dates					

Fishbone diagram

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