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Review

Do Automated Dispensing Device improve Medication Safety and Reducing Medication Error?

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Abstract

Improving Medication safety is always a key focus in the hospital setting, and pharmacists have been exploring a variety of strategies and technologies to achieve this goal. Automated dispensing machines decentralized medication distribution systems that provide computer-controlled storage, dispensing, and tracking of medications have been recommended as one potential mechanism to improve efficiency and patient safety, and they are now widely used in many hospitals [1]. There is no doubt that these machines can enhance the efficiency of medication distribution, but their capacity to reduce medication errors is controversial and depends on many factors, including how users design and implement the systems [2].

Keywords: Automatic Dispensing Device; Decision Support; Electronic Health Record; Health Information Technology; Medication Errors; Patient Safety Methodology

Introduction

In 1980s, automated dispensing devices appeared on the scene, a generation after the advent of unit-dose dispensing The invention and production of these devices brought hopes of reduced rates of medication errors, increased efficiency for pharmacy and nursing staff, ready availability of medications where they are most often used (the nursing unit or inpatient ward), and improved pharmacy inventory and billing functions [3,4,5] . Although the capacity of such systems to contribute to patient safety appears great, surprisingly few studies have evaluated the clinical impact of these devices.

In this Paper, we will see if there is Link between the using of Automation and Medication Error

Medication errors, defined in some references as any inappropriate medication management use in the prescribing, dispensing, or administration of a drug, irrespective of whether such errors lead to adverse consequences or not, are the single most preventable cause of patient harm [6].

In other globally references medication error can be defined as a failure in the treatment process that leads to, or has the potential to lead to, harm to the patient [7].

In 1999, the Institute of Medicine estimated that the hospital mortality rate due to medication errors is as much as 98,000 patients per year, thereby making these errors a major public health concern [8]. In their report, the committee recognized that addressing patient safety is the key component for the delivery of quality healthcare. It recommended improvements that have to be made in hospital systems and processes to reduce injuries. Different safety systems support the five rights of medication administration (right patient, right drug, right time, right dose, and right route) at various steps of the medication administration process [9,10]. While electronic health record systems and computerized physician order entry are primarily focused on preventing order errors in the prescribing, transcribing and documentation steps, additional errors can transpire in the dispensing, and administering phases [11] It is estimated that the majority of medication errors occurs at the prescribing (49%) and administration (26%) steps [12].

The appropriate, accurate, and timely distribution of medications to patients is a well-established responsibility of pharmacists. In acute

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care settings in particular, distribution systems have been developed that enable pharmacists to review patient-specific medication orders and oversee the preparation and packaging or selection of these medication doses, as well as the delivery of these medication doses to patient care units. Automation has evolved to ease fulfillment of pharmacists' distributive responsibilities, expand distribution system capabilities, and improve efficiency in distribution. Automated dispensing devices are an increasingly prevalent component of the medication-use process in health care organizations today. The pharmacy profession's transition to an emphasis on direct patient care, changes in health care systems, and pressures to reduce costs have all created interest in the availability and use of automated dispensing devices. ASHP supports the use of automated dispensing devices when it frees pharmacists from labor-intensive distributive functions, helps improve patient care by both pharmacists [13].

Goals for the use of automated dispensing devices in the medication-use process should focus on improving patient Automation and Information Technology–Guideline Specific objectives related to these goals may include the following: • Information necessary for appropriate medication management and patient care is accurate, accessible, and timely. • Appropriate medications are readily available and accessible to meet patient needs within safety and security controls. • Vulnerabilities to medication errors are minimized, and those that remain are identified, documented, and mediated. • Staff members involved in the medication-use process are safety conscious, accurate, and productive. • Patients are satisfied with the quality and delivery of care. • Medication distribution services are facilitated across the continuum of practice settings in the health care system. • Resource management is improved by linking supply-ordering channels to the medication distribution system. • Billing accuracy is improved by allowing charges and credits to post when medications are dispensed from or returned to the automated dispensing device [13] .

Methodology

By literature review by using Pub Med SCOPUS , by searching key ward , the role , automation , medication error , by using English Language From 2005-2019 .

Selection Criteria

Automatic dispensing device related to medication error.

The Exclusion Criteria

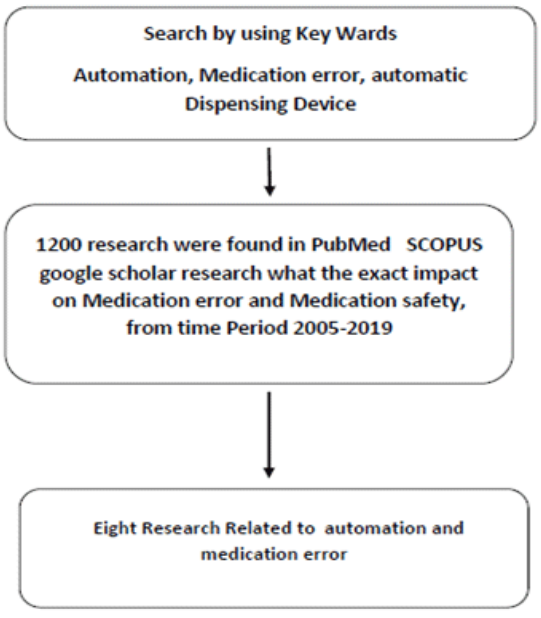
The paper that not related to medication error and use of automation

Result

1200 research were found in PubMed, SCOPUS what the exact impact of automatic dispensing device on Medication error and Medication safety, from time Period 2005-2019.

Eight 0f Researches connect the Automation with Medication Error.

Literature Review: Work Flow : Use automatic Dispensing Device and Medication error Literature Review



Publication	Target	Design	Result	Conclusion
Etienne online 2014 Jun .15 Valenciennes, France.	medication errors (MEs).	Researchers attended nurse medication administration rounds and compared administered to prescribed drugs, before and after the drug distribution system	automated drug dispensing system resulted in a 53%	Reduction in Medication Error " Adminstration Error "

Publication	Target	Design	Result	Conclusion
Bettina Wulff Riser .2018 14	Medication administration errors.	The study was a controlled before-and-after with collection	reduced the overall risk of administration	Medication administration process could reduce the occurrence of medication errors.

Publication	Target	Design	Result
J EvalClinPract. teaching hospital in Australia. **16**	Medication selection and preparation (EDs). a 377-bed tertiary	Pre intervention and post intervention study	resulted in a 64.7% (1.96% versus 0.69%, respectively, P = 0.017) reduction in medication selection and preparation errors.
Scott Oswald Richard Caldwell. 2007, **17**	A study was conducted to determine filling and dispensing error rates before and after the implementation of an automated pharmacy carousel system (APCS).	The study was conducted in a 613-bed acute and tertiary care university hospital. Before the implementation of the APCS, filling anddispensing rates were recorded during October through November 2004 and January 2005. Post implementation data were collected during May through June 2006. Errors were recorded in	Before implementation of the APCS, 422 first-dose or missing medication orders wereobserved between October 2004 and January 2005. Independent data The filling rate for automated dispensing cabinets was associated with the largest decrease in errors. of the APCS.
RainuKausha, How Can Information Technology Improve Patient Safety and Reduce Medication Errors in Children's Health Care? *Med.* 2001; 155(9):1002-1007.18	Objective To review the role of information technology in decreasing pediatric medication errors in both inpatient and outpatient settings.	Design We performed a literature review of current information technology interventions.	Results Reduce all type of Error
Farm Hosp. . The impact of automation on the safety of drug dispensing in nursing homes.2018 Jul 1;42(4):141-146. doi: 10.7399/ fh.10949. **19**	To compare the frequency and seriousness of notified dispensing errors in nursing homes when medication is dispensed manually versus automatically using a specifically selected automatic dispensing system.	A pre-post retrospective observational study in 7 nursing homes. We compare voluntarily notified dispensing errors in a manually dispensed weekly system on the one hand (year 2013), (year 2015),	Reduction 91% in dispensing errors. 43 errors reached the patient during the manually dispensing year, versus 6 during the automated year. and 5 errors versus 1 required monitoring.

[Implementation of a robot for the preparation of antineoplastic drugs in the Pharmacy Service].21 6.	To describe the implementation of a robot for the preparation of antineoplastic drugs in the Pharmacy Service and to be able to analyze the added value to pharmaco-therapy	out in June 2012 at a tertiary level The implementation was carried Hospital, taking place in two periods: 1- test period with the installation of the robot, with technical configuration of the equipment and validation of 29 active ingredients and the integration of electronic prescribing software with the robot application (9 months). 2- Usage period (22 months). On the other hand, training was given to pharmacists and nurses. The robot uses image recognition, barcode identification and gravimetric controls for proper operation. These checks provide information about the error ratio in the preparation, with a margin of ± 10%, which after a pilot study was restricted to a range of ±4%. The robot was programmed to recognize bags, infusion pumps, syringes and vials. The added value was assessed for 31 months by identifying preparation's errors.	11,865 preparations were made by the robot, which meant approximately 40% of all antineoplastic prepared from 29 different active ingredients. 1.12% (n=133) of the errors were identified by the robot and therefore didn't reach the patient (negative desviation - 4%). These errors were corrected manually.
PLoS One. Medication incidents related to automated dose dispensing in community pharmacies and hospitals--a reporting system study. 2014 Jul 24;9(7):e101686. doi: 10.1371/journal.pone.0101686. eCollection 2014.20	Automated dose dispensing (ADD) is being introduced in several countries and the use of this technology is expected to increase, as a growing number of elderly people need to manage their medication at home. ADD aims to improve medication safety and treatment adherence, but it may introduce new safety issues. This descriptive study provides insight into the nature and consequences of medication incidents related to ADD, as reported by healthcare professionals in community pharmacies and hospitals.	The medication incidents that were submitted to the Dutch Central Medication incidents Registration (CMR) reporting system were selected and characterized independently by two researchers.	From January 2012 to February 2013 the CMR received 15,113 incidents: 3,685 (24.4%) incidents from community pharmacies and 11,428 (75.6%) incidents from hospitals. Eventually 1 of 50 reported incidents (268/15,113 = 1.8%) were related to ADD; in community pharmacies more incidents (227/3,685 = 6.2%) were related to ADD than in hospitals (41/11,428 = 0.4%). The immediate cause of an incident was often a change in the patient's medicine regimen or relocation. Most reported incidents occurred in two phases: entering the prescription into the pharmacy information system and filling the ADD bag.

Discussion

Eight of Research Conducted From 2005-2019 that Related to the Impact of Automation in Medication error

Tow from eight Related to Medication administering error, related to Nursing Medication administration Part.

Two were preparation Error one in nursing station and one antineoplastic Agent Preparation.

Three related to Dispensing error.

One Related to Total Medication Error.

Automated drug dispensing system resulted in a 53% [14].

Resulted in a 64.7% (1.96% versus 0.69%, respectively, P = 0.017) reduction in medication selection and preparation errors [15].

Before implementation of the APCS, 422 first-dose or missing medication orders wereobserved between October 2004 and January 2005. Independent data the filling rate for automated dispensing cabinets was associated with the largest decrease in errors. Of the APCS [16].

Performed a literature review of current information technology interventions Reduce all type of Error [17].

Reduction 91% in dispensing errors. 43 errors reached the patient during the manually dispensing year, versus 6 during the automated year. and 5 errors versus 1 required monitoring [18].

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Conclusion

Using automatic Dispensing Device (AUD) will Decrease all Type of Error, the Analysis conducted to see before implementation of AUD and after implementation.

There was Reduction in medication administering error, dispensing error, preparation error, all type of Error.

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