Effectiveness of automated dispensing machine (ADM) to reduce the events of dispensing error on medication error in increasing patient safety: literature review

Zeni Widiastuti ¹, Madya Sulisno ²

¹Nursing Student, Nursing Department of Medical Faculty, Universitas Diponegoro, Indonesia
²Nursing Department of Medical Faculty, Universitas Diponegoro, Indonesia

ARTICLE INFORMATION
Received: March, 15, 2023
Revised: July, 25, 2023
Available online: August, 07, 2023

KEYWORDS
Patient safety, medication error, dispensing error

INTRODUCTION
Patient safety is a system that makes patient care safer, which consists of risk assessment, patient risk identification and management, incident reporting and analysis, the ability to learn from incidents and their follow-up, as well as implementing solutions to minimize risks and prevent them from occurring. There will be injuries caused by mistakes due to carrying out an action or not taking the action that should be taken (Menteri Kesehatan Republik Indonesia, 2017). Medication error is one of the most common medical errors and can have mild to severe impacts. Medication error is a medication error when the patient is in the care of a health professional that can actually be avoided (Habibah & Dhamanti, 2021). Medication errors can occur at the prescribing stage (prescribing), reading the prescription (transcribing), preparation to drug delivery (dispensing), as well as in the process of drug use (administering) (Probosiwi et al., 2021). Medication errors can affect patient safety, cost of care, endanger patients and
families, increase mortality, and lengthen hospital stays. White & Gallagher (2011) said that medication errors also had an impact on nurses, treating doctors, and also institutions (Probosiwi et al., 2021).

Data on medication errors that occurred in England (WHO, 2016) from January 2005 to December 2010 amounted to 517,415 or 10-12% of all patient safety incidents. Medication errors that occurred included the prescribing phase of 18%, the drug was lost or delayed 16%, the wrong dose was 15% and the administration was 50%. The National Map of Patient Safety Incidents reports that the rate of medication errors in Indonesia was quite high in 2007. Medication errors were ranked first out of the top 10 incidents in hospitals, namely 24.8%, where the dispensing stage was the first order in drug administration errors (Gloria et al., 2017).

Dispensing errors is one of the errors in the treatment process that can cause the patient to be disabled or even die. Data findings totaled 4849 dispensing drugs, it was reported that 130 cases experienced dispensing errors. The most common types of dispensing errors are dosage errors, medication errors, quantities and labeling (Karundeng & Permanasari, 2018). Research conducted at a government hospital in Yogyakarta in 2010 showed that out of 229 prescriptions, 226 were found with medication errors, of which 99.12% were prescribing errors, 3.02% were pharmaceutical errors and 3.66% were dispensing errors (Habibah & Dhamanti, 2021).

A solution is needed to make changes so as to reduce the incidence of medication errors. Utilization of information technology can improve service quality, minimize the risk of errors, and increase efficiency (Hanso, 2020).

There are several solutions that have been proven in reducing the incidence of medication errors, namely the implementation of computerized provider order entry, barcode systems, etc. Automated dispensing machine (ADM) is an alternative solution in reducing the number of medication errors that are available in the market. The dispensing phase in Indonesia is still carried out by humans, so the more human labor involved, the higher the risk of errors occurring. Ong, et al said that ADM has the potential to reduce errors because the pharmaceutical process does not require a lot of human labor. Research conducted at the Hospital. Bethesda in 2019 showed that after using ADM there was a decrease in dispensing errors by 69.78%. With this tool it is expected to reduce dispensing errors, (Karundeng & Permanasari, 2018).

Based on these problems, a Literature Review question can be formulated whether the use of Automatic Dispensing Machine (ADM) is effective in reducing the incidence of dispensing errors in medication errors in order to improve patient safety.
RESEARCH METHODS

This research is a literature review or literature review in which ideas, knowledge and findings are examined, understood and critically reviewed according to the chosen topic. A literature search was carried out systematically through online databases namely Google Scholar, Science Direct and ProQuest using the keywords automated dispensing machine, automated dispensing cabinets, patient safety, medication errors, dispensing errors. Researchers set the inclusion criteria in this study, namely articles published in the last 5 years, using both English and Indonesian, articles in the form of research and literature reviews, focusing on the Automated Dispensing Machine in reducing medication errors. The exclusion criteria set were articles that did not focus on the effectiveness of the Automated Dispensing Machine (ADM) to reduce the incidence of medication errors. Literature that meets the criteria is then analyzed and arranged in a synthesis matrix.

RESEARCH RESULT

Table 1. Article Analysis based on Topics Discussed

<table>
<thead>
<tr>
<th>Source</th>
<th>Description of the topic/ issue being reviewed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Writer:</strong> Douglas C, Desai N, Aroh DAM, Quadri M, Williams R, Aroh F, Nyirnda, T (2017)</td>
<td><strong>Research Title:</strong> Automated dispensing cabinets and nurse satisfaction&lt;br&gt;This study shows the effectiveness of using the new ADC machine where it can be seen that the difference in drug administration time is faster in the 3 room units that were observed, namely the oncology unit, surgical unit and orthopedic unit. The application of this new ADC machine also increases efficiency in drug administration, is effective in preventing and reducing drug administration errors. This ADC machine can also set drug warning features, possible drug reactions, and information on handling drug reactions. Nurses and pharmacists expressed their opinions in the implementation of this new ADC machine where they realized that technology plays a role in running collaborative clinical practice.</td>
</tr>
<tr>
<td><strong>Writer:</strong> Karundeng DJ, Permansasari VY (2018)</td>
<td><strong>Research Title:</strong> Automated Dispensing Machine Sebagai Salah Satu Upaya Menurunkan Medication Errors di Farmasi Rumah Sakit&lt;br&gt;This study says that the application of ADM must be integrated with electronic prescriptions, barcodes and hospital information systems to further reduce the incidence of medication errors. This integrated system has been proven to significantly reduce dispensing errors by around 15%-100%. The application of ADM machines in inpatient units has been proven to reduce dispensing errors, especially drug type and dosage errors if the drug is correctly entered into the machine. Several factors must be considered in the application of ADM machines to prevent medication errors or other errors, namely:&lt;br&gt;a. During the process of filling the drug, it must be ensured that the medicine is correct&lt;br&gt;b. There are factors that cannot be controlled by ADM while in the treatment room, such as drugs that have not been filled.&lt;br&gt;c. The location of deploying ADM machines is not recommended in the Emergency Room.</td>
</tr>
<tr>
<td><strong>Writer:</strong> Darwesh BM, Machudo SY, John S (2017)</td>
<td><strong>Research Title:</strong> The Experience of Using an Automated Dispensing System to Improved Medication Safety and Management at King Abdul aziz&lt;br&gt;This research shows that with the application of automated technology (ADM) there is a reduction in drug dispensing so that the costs incurred by the hospital are around 300,000 Saudi Riyals per month. With the application of the ADM machine, it can minimize the demand for labor in the dispensing department so that it can be optimized in the provision of IV drugs. Pharmacy services using automated technology (ADM) improve drug control efficiency, improve patient drug profile accuracy, minimize dispensing errors or other errors, namely:&lt;br&gt;a. During the process of filling the drug, it must be ensured that the medicine is correct&lt;br&gt;b. There are factors that cannot be controlled by ADM while in the treatment room, such as drugs that have not been filled.&lt;br&gt;c. The location of deploying ADM machines is not recommended in the Emergency Room.</td>
</tr>
</tbody>
</table>
DISCUSSION

Medication errors (medication errors) are incidents due to the use of drugs that are not appropriate during the treatment period by health workers so that it endangers the patient which could actually be prevented (Fadhli, 2022). Dispensing error is an error in the treatment process that can cause the patient to become disabled or even die. The most common types of dispensing errors are dosage errors, medication errors, quantities and labeling (Karundeng & Permanasari, 2018). Yosefin, et al (2016) said that dispensing errors can be caused by an unbalanced ratio of workload and human resources, preparation of drugs that are not in accordance with the prescriptions given, communication regarding insufficient stocks of pharmaceutical drugs, the absence of a special room for preparing drugs, and disruptions in other jobs (Khairurrijal & Putriana, 2017).

Sujatno (2016) said that innovation is needed to improve the safety of pharmaceutical work processes and minimize errors due to human factors and increase efficiency. The automated dispensing machine (ADM) is an innovation that can reduce the incidence of dispensing errors, and improve HR efficiency in pharmacy units. The results of the study from this study found the impact after implementing the ADC where no drug loading and unloading errors were found without wasting medication. The implementation of ADC can reduce the incidence of drug documentation errors, and can be tracked if there are substitutions for drugs that are not appropriate through the transaction log in the ADC. ADC can control the use of drugs, preventing the loss of drugs without being documented which can have an impact on medication errors.

The implementation of the ADM machine in a new hospital caused stress for the nurses and pharmacist staff with problems in the first week of using the ADM where the hardware and software could not function optimally. But in the end all pharmacy and nursing staff were satisfied with this ADM machine. Staff support, training and evaluation are needed to deal with technological challenges, especially the implementation of ADM. The application of the ADM system improves controlled drug administration and stock management. The success of ADM technology in improving patient safety depends on the workflow and behavior of nurses so that in the future the focus will be on implementing and identifying adverse impacts.

A quarter of all hospitals in Saudi Arabia have implemented an Automated Dispensing Machine (ADM) which is used to replace regular drug filling. ADM increases productivity, reduces medication errors, increases cost efficiency in the drug dispensing process, reduces the frequency of drug side effects, improves the provision of medical education services. The results of the study illustrate that ADM in Saudi Arabia is considered an effective and efficient system that can be extended to all countries. ADM is effective in reducing dispensing errors so that it can improve drug distribution and help staff, especially nurses, improve the quality of service to patients. Optimizing the use of ADM requires good cooperation and coordination between staff, providing training for staff to deal with new challenges in the field of technology.
errors because it is able to replace the role of health workers in the filling process to fulfill incoming prescription requests (Rikomah, 2017).

Automated dispensing machine (ADM) is also called Automated dispensing cabinets (ADC) which is a set of drug storage and distribution tools to increase security through an appropriate planning and implementation system (Sutanto & Semadi, 2019). The use of ADM machines aims to replace routine drug filling, improve stock management and patient safety (Alshahrani et al., 2020; Craswell et al., 2021). This ADC machine can also set drug warning features, possible drug reactions, and information on handling drug reactions (Karundeng & Permanasari, 2018).

Many problems that arise at the beginning of the use of ADM include causing stress on nurses and pharmacists because they require adaptation to face new technological challenges where hardware and software cannot function optimally. Staff support, training and evaluation are needed to deal with technological challenges, especially the implementation of ADM (Craswell et al., 2021). Factors that must be considered in implementing ADM to prevent medication errors or other errors (Karundeng & Permanasari, 2018):

a. During the process of filling the drug, it must be ensured that the medicine is correct
b. There are factors that cannot be controlled by ADM while in the treatment room, such as drugs that have not been filled.
c. The location of deploying ADM machines is not recommended in the Emergency Room

CONCLUSIONS

Automated Dispensing Machine (ADM) can be one of the long-term solutions to reduce the incidence of medication errors, especially dispensing errors, thus impacting patient safety. ADM that is integrated with barcode systems, electronic prescribing and hospital information systems has proven to be effective in reducing the incidence of medication errors. Support for staff, training and evaluation is needed to support the adaptation process to the implementation of ADM.

REFERENCES

Journal articles


Craswell, A., Bennett, K., Hanson, J., Dalgliesh, B., & Wallis, M. (2021). Implementation of distributed automated medication dispensing units in a new


**Books**

