# ROLE OF e-PRESCRIBING IN THE REDUCTION OF PRESCRIPTION ERROR RATE: A SYSTEMATIC REVIEW

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## ABSTRACT

**Background:** Prescription errors are a big problem in the world. The concept of medication safety began to become a global concern since November 1999 after the Institute of Medication (IOM) reported an unexpected event of medication error in America. Electronic Medical Record (EMR) has the potential to reduce instances of medication error and improve communication between pharmacist and prescriber. This study aimed to systematically review the role of e-prescribing in the reduction of prescription error rate.
**Subjects and Method:** This was a systematic review using articles from 3 electronic databases, namely PubMed, Google Scholar, and Medline. The keywords used in the study were e-prescribing, electronic prescription, medication error, hospital formulary, and hospital. The articles under review were taken from observational studies conducted in hospital involving EMR (electronic prescription). These articles were published from 2015 to 2019. The main outcome was the incidence of prescription error. Steps in conducting systematic review followed PRISMA flow diagram rule.
**Results:** 6067 articles were obtained for systematic review based on pre-determined keywords. 9 articles met the inclusion criteria. 4 of 9 articles discussed EMR. 5 articles discussed the use of e-prescribing with patient safety. In these articles, EMR could help reduce various errors, including difficulty in understanding the doctor's writing. The e-prescribing through EMR did not run optimally, because it lacked support of prescription tools and compliance by doctors.
**Conclusion:** The e-prescribing can reduce the number of prescription errors and maintain patient safety. The e-prescribing through electronic medical record helps doctors to prescribe according to the formulary and provides an overview of the hospital with patterns of drug use. The efforts to maintain patient safety must continue so that patient safety is maintained.

**Keywords:** electronic medical record, e-prescribing, medication error, patient safety

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## BACKGROUND

Medication safety concept has been a global concern since 1999 after Institute of Medication (IOM) reported 44,000 adverse events among inpatients in the USA even there were 98,000 people who died for medical error (mistakes made during medical care) and 7,000 cases happened due to prescription error (Oktarlina & Wafiyatunisa, 2017).

Due to reports concerning with prescribing error rate which is still high, an analysis was conducted in Dr. Cipto Mangunkusumo National Hospital to find out the rational for prescription errors. The result of analysis revealed unreadable doctors' handwriting, miswritten medication formula, shortened medicine name s, and inaccuracy in writing the strength of the medicines is the most frequent rational for prescription errors, therefore a decision was made to overcome the problems by making electronic prescribing (e-prescribing) in electronic health record.

Electronic prescription is a prescription system with the utilization of electronic me-


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dical record which is designed to facilitate medicines prescription service starts from the prescription writing stage, prescription reading stage, and medicines preparation stage up to prescription hand over, the medicine use process, monitoring process toward the taking out of prescribed medicines (Hahn, 2014).

The study aims to elaborate further the role of e-prescription implementation toward prescription error rate.

## SUBJECTS AND METHOD

### 1. Study Design

The study was systematic review which was conducted started from July to August 2019. The source of data was obtained from electronic sources: PubMed and Google Scholar. The data were obtained from the articles published between 2015 and 2019. The keywords used were (1) electronic prescribing, (2) medication error, (3) electronic medical record, and (4) patient safety.

### 2. Inclusion and Exclusion Criteria

Inclusion criteria of the study were studies conducted between 2015 and 2019, the entire studies were in a form of full length articles in English conducted at hospitals, all studies were related to electronic prescribing, prescription error, and electronic health record. The exclusion criterion was any study which was not in accordance with the above criteria.

### 3. Article Extraction

The articles were sorted by using PRISMA (Preferred Reporting Items for Systematic Reviews & Meta-Analyses) as well as flow chart which was utilized based on PRISMA 2009 guidelines to exclude articles which were not suitable. The process consisted of identification, screening, inclusion and exclusion criteria, and in the end downloading the suitable articles.

## RESULTS

By using "the effect of electronic prescribing toward prescription error" through PubMed and Google Scholar a search was made. Afterward, they were screened based on the title whether they were in accordance with the desired learning theme or not. As the result there were 778 suitable titles. Out of the 778 articles there were 158 articles which were suitable with the appropriateness based on inclusion and exclusion criteria. The final result of the reviewed was 9 articles which were the most suitable with the objectives of the study.

The nine articles presented a conclusion that by using electronic prescription there was a decrease in prescription error during prescription discharge stage. 4 out of 9 reviewed journals discussed about the utilized system/ tools yang should be user friendly so that prescribers will not find any difficulty in using the system. The other 5 articles elaborated the correlation of electronic prescription which resulted in the decrease of prescription error output with the impact in a form of the retained patient safety.


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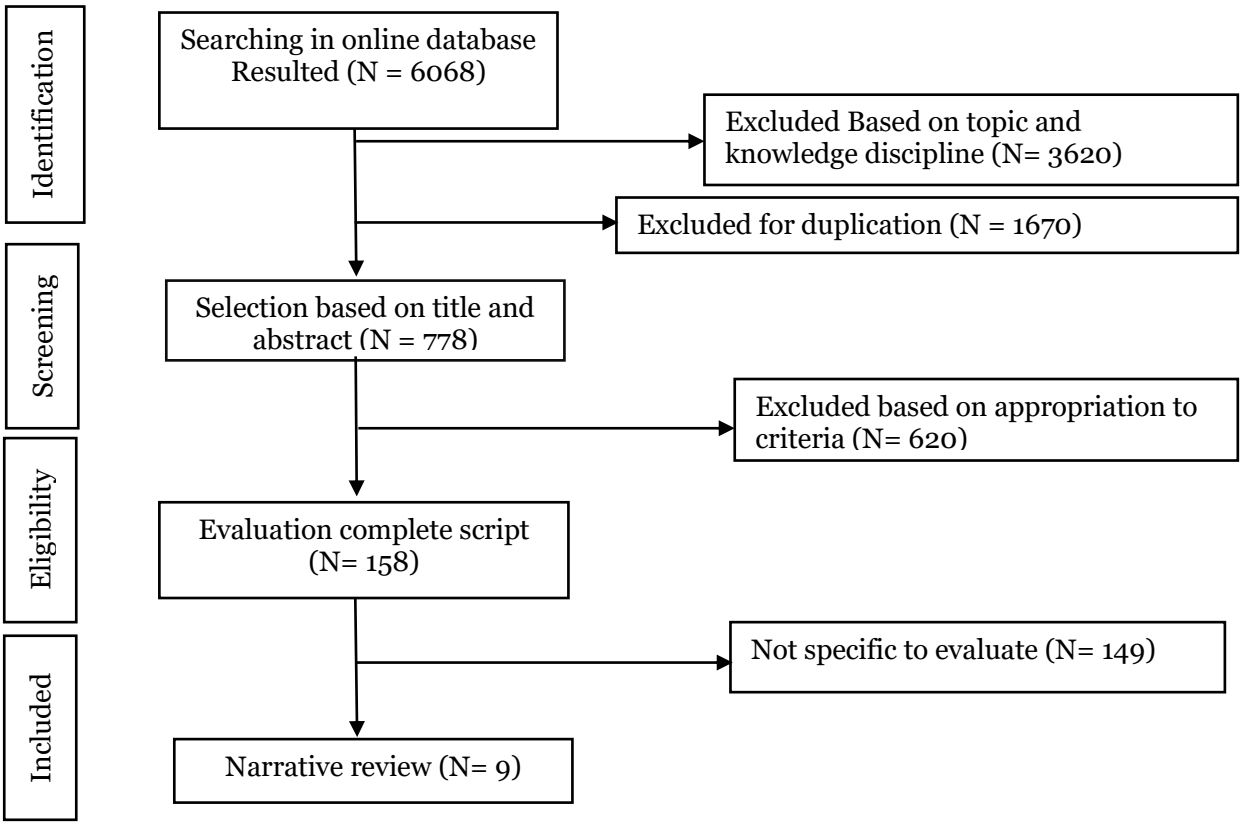


**Figure 1. PRISMA Flow Diagram**

## DISCUSSION

Electronic prescribing is a modification of method in writing prescription by using electronic system through automatic process of data addition into database by using software and closed transmission network in hospital which connects prescription with pharmacy. To ensure patients information confidentiality, electronic prescription is sent through secure and closed network which is only intended for the prescribing purpose (Kusumarini et al., 2011; Diana, 2015). Based on the reviewed articles of the study electronic prescribing reduce the rate of prescription error incidences during the prescription writing stage. However, the result of review toward 9 journals revealed there is a risk for new mistakes related to electronic prescribing which is being used at the moment. From the source of the journals read it was also concluded that there were a lot of difficulties in using electronic prescribing system/tools. One thing to be highlighted is that the practicability of using the tools becomes one of the keys of successful electronic prescribing.


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Table 1. Result of Article Collection

| No | Writer | Title | Method | Result |
|---|---|---|---|---|
| 1 | Raban | The safety of computerized prescribing in hospitals | Descriptive | The article elaborates that in Australia the use of electronic prescribing gave the effect on the decreased rate of prescription error during the prescription writing by >50%. However, there was an issue that should get further attention that is related to the utilized system/tool for electronic prescribing. The system should be user friendly for prescribers or else it would turn into an entrance for new mistakes (Baysari, 2019). |
| 2 | Taylor et al. | Pharmacist-assisted electronic prescribing at the time of admission to an inpatient orthopedic unit and its impact on medication errors | Pre and Post Study | The study explained that during 10 weeks before the implementation of electronic prescribing and 10 weeks after the implementation there was a decrease on the prescription error rate over 198 patients and 210 patients before and after the implementation of electronic prescribing. Before the implementation of electronic prescribing there were 6 errors, meanwhile after the intervention there was only 1 mistake. The implementation of electronic prescribing reduced the adverse event rate (Tran et al., 2019). |
| 3 | McLeod et al. | The impact of implementing a hospital electronic prescribing and administration system on clinical pharmacists' activities | Mix method study | The study provided quantitative and qualitative information about the impact of the electronic prescribing implementation toward the activities of wards' pharmacists. There was a decrease of prescription errors during prescription writing. There were several officers who were not familiar with the electronic system needed longer time, however there were many who wrote the prescription factor (McLeod et al., 2019). |
| 4 | Howlett et al. | Defining electronic prescribing and infusion related medication errors in pediatric intensive care | Quantitative and qualitative study with Delphi Methode | The study elaborated the utilization of smart technology in electronic prescribing and automatic IV pump in intensive care unit generated different consensus. The initial purpose of the technology utilization was for patient safety however a system fault possibly happened that generated certain concern especially for intensive care area (Howlett et al., 2018). |
| 5 | Crespo et al. | Improving the Safety and Quality of Systemic Treatment Regimens in Computerized Prescriber Order Entry Systems | non-randomized study | The study elaborated about chemotherapy regimen prescription. There were nine hospital which were reviewed. Out of the nine hospitals there were only two hospitals that conducted electronic prescribing development and maintenance. It was proven that the two hospitals made only 6% mistake during the process of regimen writing (Crespo et al., 2019). |
| 6 | Amato et al. | Computerized prescriber order entry–related patient safety reports | Cross sectional | The study elaborated that out of 2522 medication errors there was 86.9% of electronic prescribing prevented the incident of medication errors. Electronic prescribing ensured that patients received the medicines timely as well as reduced the |


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| | | | | mistakes of the unreadable hand writing (Amato et al., 2017). |
| 7 | McMullen et al. | Effect of computerized prescriber order entry on pharmacy | Mix method study | The study elaborated that prescription errors during prescription writing were reduced however the process of medicine preparation and medicine hand over were still hindered. Prescription writing error could be minimized by the implementation of electronic prescribing however prescription piling occurred that the workload of the pharmacists was increased to meet the order, and also the mistakes in giving information during medicines delivery were sill occurred in the electronic prescribing. ( McMullen et al., 2015) |
| 8 | Jheeta and Franklin | The impact of a hospital electronic prescribing and medication administration system on medication administration safety | Observation study | The study elaborated the result that there was not much different between before and after implementing electronic prescribing. The risk for mistakes had shifted, in other words an increase of administration mistake had occurred especially for users who were not familiar with the system (Jheeta dan Franklin, 2017) |
| 9 | Baysari et al. | Redesign of computerized decision support to improve antimicrobial prescribing | Pre and Post Study | The study elaborated the utilization of electronic prescription to increase the use of appropriate antimicrobial did not generate significant result. The reason of it among others was there was an indication that it was included into unmonitored/ unupdated/ un-followed up electronic system and also that the prescription of antimicrobial should obtain licensing which sometimes was not in line with the indication of antimicrobial utilization. Therefore, it required policies and development to be harmless for patients and create patients' safety. (Baysari et al., 2017) |


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Potential new failures in electronic prescribing stage occur if development of user friendly system, system maintenance, and patients database up date are not conducted. Big risk also occurs from prescription administration side, for example when the database is not updated than there will be no information provided for the prescribers related to patients' allergy or ongoing treatment.

Therefore, the principle of "do no harm" to patients does not well run. When electronic prescribing administration errors occur, information mistakes of medicine delivery may also take place that it may generate delay for the patients to get their medication. The other risk for other that may occur is medication duplication. System development of electronic medical record should be accompanied by interoperability in various systems. With the existence of connected (*interoperable)* and integrated system, it may minify the possibility of errors to happen toward the prescribing process so that it will be reducing the possibility of medicine error to occur.

Related to "do no harm" principle and patient safety, based on the Health Minister's Regulation No. 11 /2017 about patient safety therefore medication error is included into incident whether it is Near Miss or No Harm Incident. Types or error of technology implementation still contributes toward the prescription error that it requires regulation for the improvement. Root Cause Analysis method should continually be conducted toward the incidents occur related to prescription errors.

It can be concluded that new risks occur along with the technology advance adapted for electronic medical record. Therefore the technology users should keep on developing the system to make it easy to use, conducting system maintenance, educating system user as the prescribers and updating patients database. If incidents related to medication errors occur it is necessary to search for the root of the problem to appropriately plan the program to reduce the risk for repeated incidents.

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