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THE ROLE OF THE E-PRESCRIBING SYSTEM IN HEALTHCARE: A SYSTEMATIC REVIEW

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ABSTRACT

The electronic prescribing system has a good role in health services with the powerful features that this system has, when compared to manual prescribing. This systematic review aims to determine the role of the electronic prescribing system in health services. The literature search was conducted from 21 November 2022 using PubMed, ProQuest, Google Scholar, ScienceDirect, Scopus, and Sage PUB as literature search area databases. A literature search strategy using BOOLEAN Operator to help specify the search terms. Literature search based on inclusion criteria. After eliminating duplication, title, abstract and full text, 8 articles were obtained for analysis. The electronic prescribing system has a good role in health services, including reducing medication errors, improving the quality of communication and information both between staff and staff and patients, shortening service time, having an alert system that is able to detect allergies, drug interactions, and adverse drug reactions. desired, time and cost efficiency, effectiveness in terms of patient safety, providing satisfaction for users because with these qualified features they can help in terms of service when compared to manual prescriptions. Further research should be conduct to review the role of Clinical Decision Support System and the electronic Health Record in healthcare due to its limitation.

Keywords: Electronic prescribing system; E-prescribing; E-prescription; Healthcare

1. INTRODUCTION

An electronic prescription system, also known as e-prescription, is the use of a data entry system to produce recipes, in addition to writing them down on paper. Automating the outpatient prescribing process has many potential benefits for different healthcare stakeholders. The benefits of the electronic prescribing system itself include: (1) improving patient safety through prescription that can be read and checked by computer for possible adverse interactions; (2) improving efficiency of the prescribing process through the actual entering of a new prescription takes about 20 seconds longer per patient than writing a prescription, this time is offset by the time saved because of the fact that less clarification is needed for electronic prescription; (3) increase patient satisfaction, through faster prescription fulfillment and fewer errors; (4) Save costs by increasing patient medication adherence. Improved adherence to medication therapy can lead to better health outcomes and reduce costs compared to paper prescriptions (Porterfield et al., 2014).

Several studies have been conducted on the advantages of electronic prescribing systems when compared to manual prescriptions. Based on research conducted by (Hinojosa-Amaya et al., 2016) in terms of observations of medication errors that occurred in hospitals before and after the implementation of the electronic prescribing system, the number of medication errors that occurred before the implementation of the electronic prescribing system was far greater when compared to after the implementation of the electronic prescribing system. This is because the

prescription cannot be clearly read in the handwritten prescription manual, which contributes to the occurrence of transcription errors, especially for LASA drugs. A similar study was conducted by (Ababneh et al., 2020) in which the number of medication errors that occurred in manual prescribing was far greater than when using an electronic prescribing system. Errors occur because manual prescriptions cannot detect the correct dose, amount, frequency, route of drug administration, duplication of therapy, and drug interactions. With the existence of an electronic prescribing system, these errors can be reduced because the features contained in the system are very supportive. These studies are in accordance with the literature on electronic prescribing systems, in which the system provides benefits in reducing medication errors so that it can play a role in good service quality (Porterfield et al., 2014).

Electronic prescribing systems have been implemented in various health care facilities in several countries. Estonia has been implementing this system for ten years with additional features such as DDI-alerts and cross-border exchange of prescription data. In 2022, Estonia develops Pharmacoegonomics (PGx) recommendations based on patient genetic data in prescribing systems, which will offer increased opportunities for patients in terms of personal care (Kõnd & Lilleväli, 2019). Other countries implementing this system and included in the electronic prescribing market report include Asia-Pacific, Western Europe, Eastern Europe, North America, South America, the Middle East, and Africa (ReportLinker, 2022). Medication errors, which are a major cause of concern for medical professionals globally, where more than 70% of errors are reported in pharmacies and hospitals, are the main triggers for the implementation of electronic prescribing systems in various countries. More than 90,000 deaths occur as a result of medication errors, one of which is Adverse Drug Events (ADEs), enabling electronic prescribing systems to be a solution in terms of health services. So that in this case the staff of the health service provider can access the patient's previous medication history (Fortunate Business Insight, 2022).

Researchers want to conduct a systematic review about role of the electronic prescribing system in health services, because with this integrated system it is also equipped with various supporting features that are capable compared to manual prescribing. A similar systematic review was previously carried out by (Mohsin-Shaikh et al., 2019) namely the impact of the electronic prescribing system on the work practices of health professionals in hospitals. A previous systematic review conducted by (Roumeliotis et al., 2019) mentioned the effect of the electronic prescribing system strategy on medication errors and hospital injuries. However, there has never been a systematic review that discusses the role of the electronic prescribing system in healthcare, both the role for health workers so that it provides good benefits, as well as the role for healthcare itself, so that it can provide good benefits as well. Therefore, researchers want to conduct this systematic review.

2. METHODS

2.1. Literature Search Strategy

The literature search was conducted from 21 November 2022 using PubMed, ProQuest, Google Scholar, ScienceDirect, Scopus, and Sage PUB as literature search area databases. This literature search process is focused on the topic of the systematic review, namely " The Role Of The E-Prescribing System In Healthcare". A literature search strategy using BOOLEAN operators such as "AND" and "OR" is carried out to help specify the search terms. In this case the keywords used for each search are searches in each database "electronic prescribing AND system AND healthcare".

In the process of searching the literature using inclusion criteria and exclusion criteria, taking into account the possibility of the article to be analyzed. Inclusion criteria are criteria that need to be met by each member of the population that can be taken as a sample. Exclusion criteria are criteria for members of the population that cannot be taken as a sample. We are used inclusion and exclusion criteria in the literature search there are listed in **Table 1** as follows.

Table 1. Inclusion and Exclusion Criteria of Article

Inclusion Criteria	Exclusion Criteria
Articles published in the period 2017 – 2022	Articles published less than period 2017 - 2022
Articles discuss the e-prescribing system in the quality of health services	Articles discuss some information systems other than e-prescribing systems
	The article does not discuss the e-prescribing system in healthcare
Articles can be accessed in full text, and free of charge	Articles cannot be accessed in full text and paid

Based on **Table 1**, the selection of inclusion and exclusion criteria in the form of selecting articles must be published within the 2017-2022 period (5 years). This is because 5 years is the ideal time to get an up-to-date article (Belcher, 2009). Other inclusion criteria such as articles discussing topics from a systematic review, so that the discussion is more focused on the topic does not stray to other topics. Therefore, it is necessary to select articles with appropriate topics to be identified as references (The University of Texas, 2022).

2.2. Article Selection and Quality Assessment

The researcher selects the articles to be used in this systematic review by filtering the articles. Titles and abstracts of articles were independently checked by two authors using the Joanna Briggs Institute (JBI) critical appraisal (Joanna Briggs Institute, 2022). JBI critical appraisal was chosen because it has been proven valid for assessing the quality of cross-sectional, case control, cohort, randomized controlled trials (RCTs), systematic reviews, and quasi-experimental research methodologies. The results of this appraisal can then be used to inform synthesis and interpretation of the results of the study. The value given from the quality assessment of the article is a maximum of 10 for the highest quality value and 1 value for the lowest quality. Decisions regarding the quality of the eligibility of the article are made by two authors, if the authors do not agree on the article, then a discussion will be held (George et al., 2014)**.** This is necessary to avoid elements of subjectivity in systematic reviews, therefore two researchers are needed in selecting articles, assessing the quality of articles, and also extracting data. A third person is needed as a problem solver (Stoll et al., 2019).

2.3. Data Extraction

Data extraction was carried out by two researchers. Data extraction was conducted by one author (ATA) and checked by another (NMY). The extracted data includes the author, year, and country; information system strategy; study locations, data collection, interventions, and outcomes. Where the data extraction will provide information about studies that are included in the characteristics of each study so as to reduce the risk of bias.

3. RESULTS AND DISCUSSION

3.1. Literature Search Strategy

A total of 185 articles were generated from the PubMed, ProQuest, Google Scholar, ScienceDirect, Scopus and Sage PUB databases. The process of searching for the article referred to the PRISMA guidelines (Page et al., 2021) by taking into account the inclusion and exclusion criteria that had previously been set. Based on the article search process that has been carried out, 8 articles are obtained in full text and meet the requirements so that an analysis of the articles can be carried out. The process of searching for articles is presented in the form of a PRISMA diagram which can be seen in **Figure 1** below.

3.2. Quality Assessment

The results of evaluating the quality of the articles using the JBI critical appraisal yielded a score of more than seven, so methodologically it was said to be very good. Discrepancies in this quality assessment were resolved by discussions. In the case of discrepant judgements, a third author (SAK) was involved. The results of the quality assessment can be seen in **Table 2**.

3.3. Data Extraction

Data extraction was carried out after a literature search process and a quality assessment of the literature. The results of data extraction are shown in **Table 3** as follows.

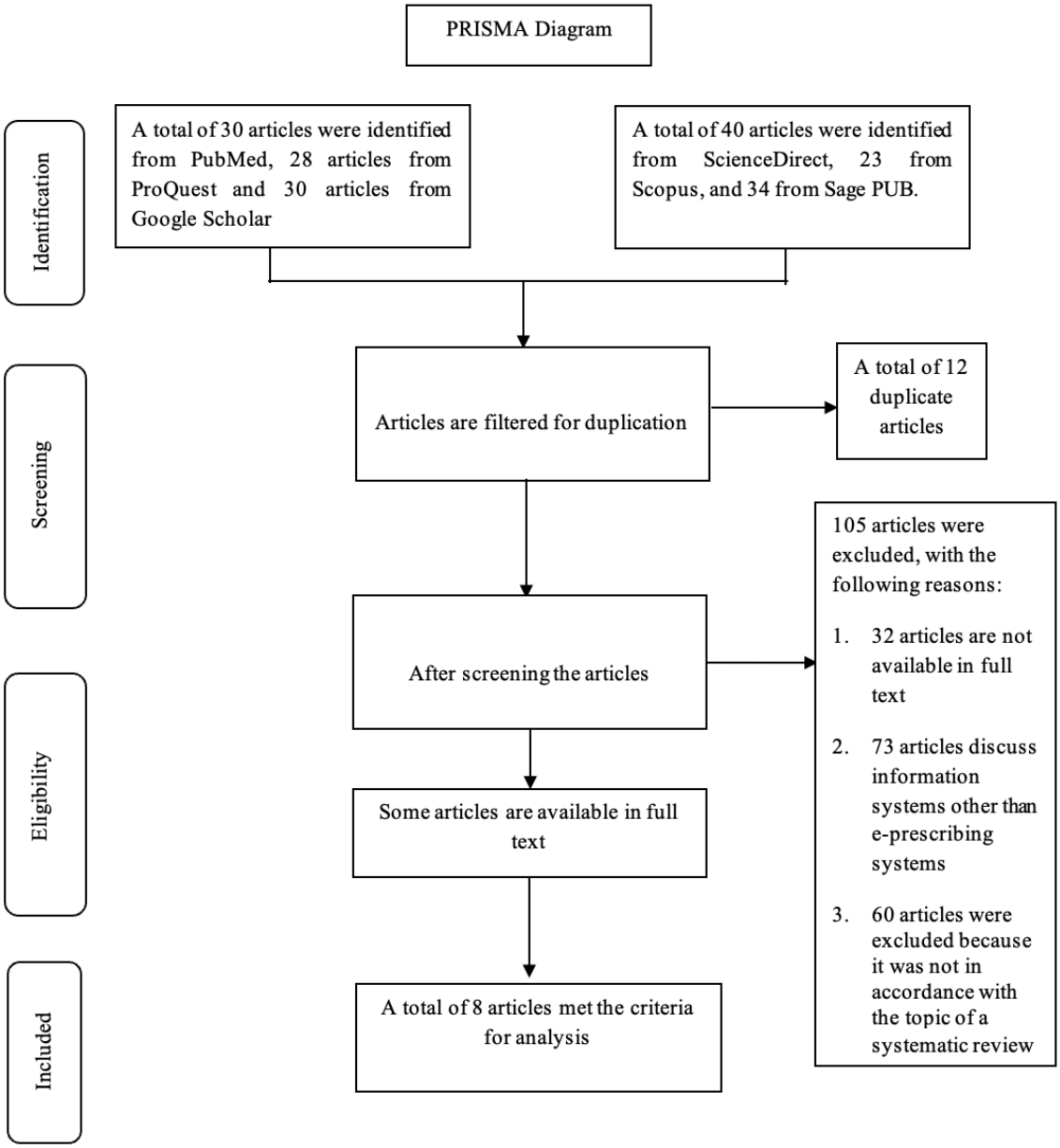

Figure 1. Literature Search Strategy (Page et al., 2021)

Table 2. Quality Assessment of Articles

No	Author and Year	Score
1	(Hindmarsh & Holden, 2022)	9
2	(Teferi et al., 2022)	8
3	(Farghali et al., 2021)	8
4	(McCulloch et al., 2020)	10
5	(Raeesi et al., 2020)	9
6	(Lau et al., 2019)	8
7	(Almutairi et al., 2018)	9
8	(Mills et al., 2017)	8

Table 3. Data Extraction Result

Author, Year, Country	Electronic Strategy	Setting	Data Collection	Intervention	Outcome
(Hindmarsh & Holden, 2022), United Kingdom	electronic prescribing system	Hospital	Collect data before and after using the electronic prescribing system	Assess prescribing error rates, time required for discharge of patients taking IV drugs, time between prescribing and administering mixed drug infusions	The system is able to reduce the rate of prescription errors and shorten the patient discharge process and also the time between prescribing and administering mixed infusion drugs
(Teferi et al., 2022), Ethiopia	electronic prescribing system	Hospital	Questionnaire about doctors' perceptions as users of the e-prescribing system	Collecting data obtained from a questionnaire which includes doctors' perceptions of the e-prescribing system	The system is able to reduce the prescription error rate and provide benefits for doctors as users
(Farghali et al., 2021), Canada	electronic prescribing system	Community Pharmacy	Online questionnaires were distributed about the ease of use and benefits of the e-prescribing system	Collecting data obtained from online questionnaires which include: (1) ease of use of the e-prescribing system (2) the benefits of the e-prescribing system	1. The e-prescribing system can reduce medication errors 2. The e-prescribing system provides user convenience by increasing productivity
(McCulloch et al., 2020), United Kingdom	electronic prescribing system	Hospital	Collect data before and after using the electronic prescribing system	Comparing the data of N-acetylcysteine prescribing error before and after the application of the electronic prescribing system	electronic prescribing system is able to reduce prescribing errors on the use of N-Acetylcysteine
(Raeesi et al., 2020), Iran	electronic prescribing system	Hospital	Online questionnaire about e-prescribing system	Knowing the effectiveness and efficiency of the e-prescribing system	electronic prescribing system has effectiveness and efficiency in terms of health services
(Lau et al., 2019), Australia	electronic prescribing system	Hospital	Cross-sectional survey on e-prescribing systems	Knowing the effectiveness and efficiency of the e-prescribing system	electronic prescribing system has effectiveness and efficiency in terms of health services
(Almutairi et al., 2018), Kuwait	electronic prescribing system	Primary Health Care	Cross-sectional survey on e-prescribing systems	Collect data on staff experience using the e-prescribing system, system knowledge, and benefits of the system	The e-prescribing system is easy to use, has good functions and benefits in terms of health services
(Mills et al., 2017), United Kingdom	electronic prescribing system	Hospital	Semi structured interview with a Framework Approach	Gather information about communication between staff before and after the implementation of the e-prescribing system	e-prescribing system can improve maintaining communication between staff in terms of service because the system is easy to use

3.3.1. Role of e-Prescribing System in Hospital

Based on the results of a literature search and an analysis of the literature, in general the electronic prescribing system has a good role in terms of health services. Electronic prescribing systems are able to reduce prescribing errors as evidenced by observations before and after implementing the system. Electronic prescribing system is a system is able to reduce prescribing errors in United Kingdom teaching hospital, especially for Intravenous infusion drugs, which include infusion volume errors, infusion dosage errors, infusion diluent errors, and also infusion

rate errors. In addition to reducing the error rate in prescribing intravenous infusion drugs, the system is able to shorten the preparation time for these intravenous infusion drugs (Hindmarsh & Holden, 2022).

Based on research that done in Queen Elizabeth Hospital Birmingham (QEHB), United Kingdom, an electronic prescribing system was able to reduce the error rate of N-Acetylcysteine prescribing for patients who overdosed on Paracetamol. These prescription errors include dosage errors, infusion rate errors and infusion fluid volume errors. In addition, the system is able to improve the timeliness of N-Acetylcysteine prescribing. This is evidenced by the observations made before and after the implementation of the electronic prescribing system (McCulloch et al., 2020).

Electronic prescribing system has some benefits in United Kingdom district hospital, like improving patient safety, patient quality of life, improving the quality of communication and information both between staff and staff and patients when compared to prescriptions. manuals. So that in this case, medication errors can be avoided and the quality of health services will be better with the existence of an electronic prescribing system (Mills et al., 2017).

Based on research that done in Amhara hospital, doctors gave many positive perceptions from interviews regarding the use of electronic prescribing systems in health services, including the system being able to increase awareness of drugs, the system being able to promote the use of data for research, the system giving warnings when patients receive medication, the system is able to save time and reduce errors, the system is safer than manual prescriptions, and the system is able to reduce health care costs (Teferi et al., 2022).

The electronic prescribing system has benefits in terms of efficiency and effectiveness in health services (Raeesi et al., 2020). Benefits in terms of efficiency consist of a time dimension and a cost dimension. Benefits in terms of the time dimension include the system being able to correct errors in a short time, the system saves patient time to receive drugs because prescriptions are based on drug availability at the pharmacy, the system saves time for prescribing compared to manual prescribing, the system shortens patient waiting time, the system saves time doctors, the system accelerates the performance of staff, and the system allocates more time for patients. The benefits in terms of the cost dimension include the system saving organizational resources through drug registration, the system reducing medical costs by choosing medicines covered by insurance, the system reducing the number of prescriptions per patient and the system reducing general costs incurred by patients. In addition to benefits in terms of efficiency, electronic prescribing systems have benefits in terms of effectiveness. These benefits include the system being able to prescribe better drugs by providing system warnings, better drug prescribing by getting access to patient medication history, the system being able to improve patient safety, reducing the occurrence of errors in medication, better drug prescribing according to clinical guidelines so as to be able to prescribe more effective drugs, and increase awareness in providing services. In addition, the electronic prescribing system has other benefits in terms of effectiveness, namely the system can contain the registration of all the drugs in question, the system supports better exchange of information between doctors and pharmacies, the system facilitates greater control over daily drug prescriptions, the system eliminates doctor's job demands in prescribing drugs, and the system contains a history of patient drug use.

Patient in Australian hospital networks give some perceptions such as positive responses about e-prescribing system, such as prescriptions that are easier to read compared to manual prescriptions, drug prescribing is safer so that it can assist in drug preparation, the system provides a complete history of drug use, then with a system (Lau et al., 2019). With this, filling prescriptions at pharmacies is faster, communication between patients and healthcare staff is better, patients are more comfortable with the privacy of drug information on computers, and many patients feel they prefer prescriptions generated by computers or in this is an electronic prescribing system. In addition to positive responses to the electronic prescribing system, patients

also have an assessment of important features contained in the system, including the patient's previous medication history, history of previous prescriptions, history of doses that have been used or previously prescribed, notes regarding adverse drug reactions or allergies, warnings presence of drug interactions and warning of allergies and adverse drug reactions. Apart from the patients, the survey was also conducted to the prescribing doctors. Doctors have positive responses, namely the system reduces manual data entry as a whole, for example choosing pre-filled drugs, how to use drugs, and prescribing information, the system reduces the possibility of errors in preparing drugs and the system makes it easier for patients to receive their prescriptions. Meanwhile, the features in the electronic prescribing system that are very important according to doctors include viewing information on prescriptions, the ability to view patient medication history, the ability of the system to view the availability of various dosage options as well as adverse drug reactions, clinical decision support such as drug interaction warnings. and allergic or adverse drug reactions.

3.3.2. Role of e-Prescribing System in Community Pharmacy

Mostly community pharmacies in Canada stated that e-prescribing has a major impact on reducing medication errors and improving the quality of health services. Electronic prescribing system can improve quality of health services by give positive impact on pharmacy productivity. This system is needed in terms of improving service efficiency in pharmacy because ambiguity is found in manual prescribing, the workflow of the pharmacy is disrupted. It is necessary to promote the use of e-prescribing systems throughout the world so that the potential benefits of this system in terms of increasing patient safety and reducing medication errors can be known in worldwide (Farghali et al., 2021).

3.3.3. Role of e-Prescribing System in Primary Health Care

Electronic prescribing system is the system that can be used for most prescriptions, can be accessed and used easily in Public Health Center in Kuwait. System also can display demographic information from patients. Apart from the knowledge aspect, in terms of usability, there have been many positive responses from doctors to the electronic prescribing system. System can allow doctors to choose all drug categories for patients by knowing patients' medication history, patients' health care history, and patients' allergic history. For example, if patients had allergy of ACE inhibitor drugs physicians can determine alternative drug for patient by using patients' history. This system also supporting alert so patients' allergy and adverse drug interactions can be warning. This system allows doctors to search by drug name so that doctor can create new prescription easily than write on paper, the system allows doctors to print medical information sheets and print patient information sheets. This system can leads to greater patient safety by reduce prescribing errors with prescription components include doctors' electronic signature that are automatically complete and recipes that are easy to read when compared to paper prescriptions. This system can help physicians prescribe medication safely by perform dose calculation (Almutairi et al., 2018).

Apart from usability, doctors also mentioned the benefits of the electronic prescribing system. This system can contribute to higher quality healthcare by saving time, cost saving, increase pharmacy productivity by task completion faster, promotes good communication between doctors and pharmacists, give results in better security and confidentiality by provides better patient privacy protection. This system can lead to greater patient satisfaction as patients wait for drugs to be prepared more shorter than manual prescribing (Almutairi et al., 2018).

The electronic prescribing system has uses in terms of providing user satisfaction, which is useful in assisting doctors in carrying out their work, facilitating the work of doctors as users, the system is able to maintain data accuracy because it is integrated, the system is able to increase the speed and efficiency of order processing, and also does not take time. Therefore, staff support

technicians are needed to maintain and resolve existing technical problems from the electronic prescribing system (Almutairi et al., 2018).

4. CONCLUSION

Based on the results of this systematic review, it was concluded that articles that have high quality ratings can explain the role of the e-prescribing system in healthcare such as hospital, community pharmacy, and primary healthcare. This systematic review limited only in several healthcare, there are no explain about role of e-prescribing system in another healthcare, such as clinic and dispensary.

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6. CONFLICT OF INTEREST

The author declares that there is no conflict of interest in the preparation of this systematic review.

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