RELATIVE EFFECTIVENESS OF ELECTRONIC MEDICAL RECORD COMPARED TO PHYSICAL MEDICAL RECORD: A SYSTEMATIC REVIEW

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ABSTRACT

Background: Medical data recording is one of the basic clinical tools. Electronic Medical Record (EMR) is important for data processing, communication, and effectiveness of patients' information access, confidentiality, ethical and/or legal issues. The quality of medical record reflects of the quality of care of patient. This study aimed to review systematically relative effectiveness of EMR compared to physical medical record.
Subjects and Methods: This was a systematic review conducted by searching articles from the following databases: ProQuest, Oxford, and PubMed published from January 2014 to 2019. Systematic review was conducted through six steps: (1) Framing a question (based on a theory); (2) Running a search (on ProQuest, Oxford, and PubMed); (3) Reading the abstract and title of the individual papers; (4) Abstract information from the selected set of final articles; (5) Determining the quality of the information in these articles. This was done using judgment of the internal validity and the GRADE criteria; (6) Determining the extent to which these articles were heterogeneous. After review process, 9 articles were including in this review.
Results: EMR is more effective in terms of communication, completeness, number of medical errors, and continuity of surveillance compared to physical medical records.
Conclusion: EMR is more effective than physical medical records to reduce medical error.

Keywords: electronic medical record, physical medical record.

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BACKGROUND

Patient safety is now a national priority. As a result, health care has become a watchful eye for the past few decades. Every year, cases of medication errors are reported to be high enough to result in losses to patients and cause an increase in hospital spending. In the USA, it is estimated that 200,000 people died due to medication errors. The process that can be explained in various stages of prescription writing, recipe reading, compounding, drug administration, administration and monitoring has been proven to be error-prone (Cheshire, 2014).

At present, the development of information technology (IT) is the dominant thing to improve the quality of health care and patient safety. Electronic medical records are essential components of technological developments in the health sector. At present, many health information technologies have been implemented in health services, such as e-prescriptions, electronic medical records, and electronic reporting systems without analyzing the effect on health services (Jawhari, 2016).

One of the challenges of the hospital is to store more and more medical records so that they require a larger space. For checking the medical records, more personnel are needed. Electronic medical records can speed up communication, improve service, reduce medical errors, and reduce waste. Electronic medical records can also increase

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clinical workflow and can support decision support systems (DSS). However, there are problems in implementing electronic medical records, such as costs, privacy and confidentiality issues, and lack of resources (Kopcke, 2013).

SUBJECTS AND METHOD

1. Design of the Study

Guidelines for this systematic review refer to PRISMA (Preferred Reposting Items for Systematic review and Meta-Analysis Protocols). The search was carried out systematically on 3 databases of scientific literature, namely ProQuest, Oxford, and PubMed. The search was conducted for 7 (seven) days from 22-29 July 2019. The search terms included Electronic Medical Records, Physical Medical Records. Search documents were limited by journals in English and Indonesian.

2. Inclusion and Exclusion Criteria

The keyword used in the initial search was "Electronic Medical Record" and found 2,356 documents. Then we enter the inclusion criteria where the journals were published in the last 5 years. Then we excluded documents that conduct a study in other health facilities, such as primary level health care facilities (Primary Health Care) and homecare. The final step, we did screening the titles and read abstracts that support this study.

3. Data Extraction

We have examined the titles, abstracts and discussions in the search journals and made them into structured data for reference.

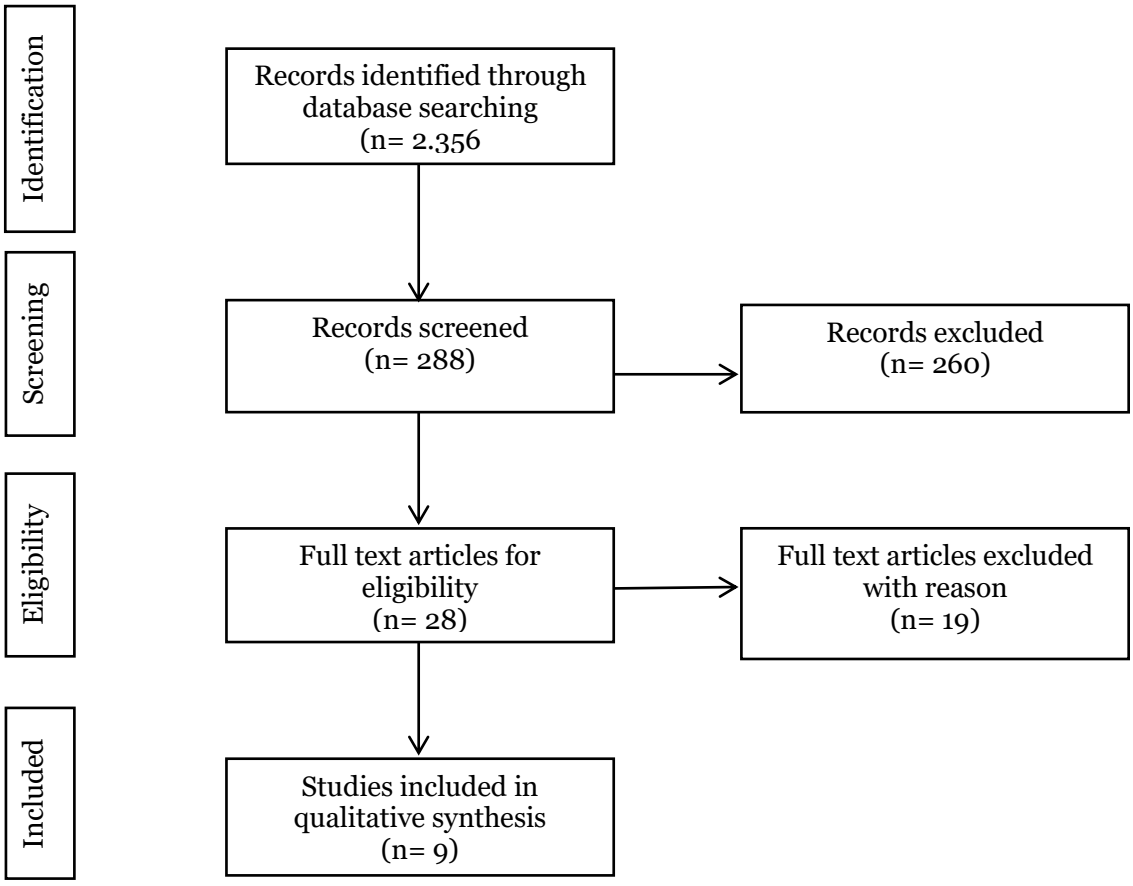

Figure 1. PRISMA Flow Diagram

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Table 1. Articles reviewed in this study

No	Author (Year)	Tittle	Country	Results	Conclusion
1	Perry et al. (2014)	Assessment of the impact of time to complete medical record using an electronic medical record versus a paper record on emergency department patients: a study	Canada	A cohort study at the Ottawa Hospital ER that examined the use of time to complete medical records using electronic medical records compared to physical medical records. To complete the electronic medical record takes 5-9 minutes while the physical medical record only takes 2-6 minutes.	The use of electronic medical records requires more time than physical medical records.
2	Mather et al. (2018)	Secondary EMR data for quality improvement and research: A comparison of manual and electronic data collection from an integrated critical care electronic medical record system	Canada	A retrospective cohort study comparing surveillance using manual and automatic medical records. This study shows that surveillance using electronic medical records shows the same results as manual data.	Surveillance using electronic medical records is easier, faster, and accurate results.
3	Koppel and Majumdar (2015)	Electronic Health Records and Quality of Diabetes Care	Canada	A study comparing the completeness of electronic medical records with physical medical records.	The results showed that writing in electronic medical records is more complete than physical medical records.
4	Sevick et al. (2017)	A systematic review of the cost and cost-effectiveness of electronic discharge communications	Canada	A systematic review of the cost effectiveness of electronic medical records with the implementation of medical resumes for patients returning home with computerization. This study did not pay attention to patient satisfaction, doctor satisfaction, the number of patient re-admissions, and the number of deaths associated with implementing electronic discharge.	This study shows that electronic medical records are cheaper compared to physical medical records (average difference of $ 0.331 per patient discharge)
5	Shahmoradi et al. (2017)	Electronic Health Record Implementation: A SWOT Analysis	Iran	SWOT analysis to determine the implementation of electronic medical records at the University Hospital of Tehran, Iran. This study was followed by 90 people (including managers and staff).	Power • Quick and easy access to information • Reduce double medical

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					record numbers • Speed up service • Prevent medical errors Weakness • Need for equipment and programs • Add paramedic workloads
6	Helena et al. (2016)	Feasibility of extracting data from electronic medical records for research: an international comparative study	UK	Comparative study of electronic medical records in 16 countries. In developed countries, has adopted an electronic medical record. For developing countries, electronic medical records have begun, but there is still a lot of support from the government regarding financial incentives and policies.	For the implementation of electronic medical records need government support in terms of financing and policy.
8	Shawahna et al. (2014)	Electronic Prescribing reduces prescribing errors in public hospital	Pakistan	A cohort study that calculated the number of errors in drug administration with manual prescribing and e-prescription. The number of errors with manual prescribing was 418/ 2,480 (16.9%), while errors with e-prescription were 123/ 2.790 (4.4%)	E-prescription can reduce the number of medication errors.
9	Porterfield et al. (2014)	Electronic Prescribing: Improving the Efficiency and Accuracy of Prescribing in the Ambulatory Care Setting	USA	The use of e-prescribing has a positive impact on health services, such as: • Increase patient safety • Facilitate the prescribing flow • Reducing hospital spending for patient recovery due to medication errors	E-prescribing facilitates prescribing in outpatient services.

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RESULTS

From the search results, a total of 2,356 records were identified from 3 databases. After identifying 288 articles, 260 articles were excluded. The remaining 28 articles were assessed for eligibility, 19 articles were issued. The review examines the comparison between electronic medical records and physical medical records

DISCUSSION

Electronic medical records show benefits in improving medical communication compared to manual medical records. Electronic prescribing, receipt of electronic prescriptions, and electronic reconciliation systems have shown benefits in reducing medical errors (Porterfield, 2014).

Unlike physical medical records that can only be seen in one place. Electronic medical records can be accessed in several places at once, both inside and outside the hospital. Doctors can access patient information quickly (clinical, laboratory, radiology, and hospital administration documents (Paterick, 2018).

Assessors are people who have registered with the system and are given permission to access according to their authority. However, this also represents a potential risk for invasion of privacy. Privacy violations can be reduced by using passwords, logging in or logging off, monitoring access (Paterick, 2018). In the USA, it is estimated that 200,-000 people die per year because of drug errors. This error also affects the hospital that has to pay for the patient's treatment. The use of electronic medical records shows a decrease in drug administration errors. The number of errors with manual prescribing is 418/ 2,480 (16.9%), while errors with e-prescription are 123/ 2,790 (4.4%) (Shawahna, 2014).

An electronic medical record can save $ 0.331 per patient home compare to a physical medical record. However, the time required for filling out electronic medical records is longer (5-9 minutes) compared to filling physical medical records (2-6 minutes). This can be affected by the character of HR (age, education, etc.) or the electronic medical record template (Perry, 2014).

In Arizona, an innovation has been made where the system automatically cancels prescription drugs if the doctor fails to calculate the right dose for patients with impaired liver function/ impaired kidney function or the automatic system cancels the same examination request (Koppel, 2015).

The use of computers/ tablets in electronic medical records must be guaranteed security. So it is recommended for hospitals to facilitate computers, software, and standardized systems for the implementation and implementation of electronic medical records (Brundin, 2018).

Electronic medical records can tempt clinicians to narrow visit times, can copy-paste previous medical records or also called "pseudohistories" or "pseudoexams" (Brundin, 2018).

A retrospective cohort study in Canada compared surveillance using manual and automatic medical records. This study shows that surveillance using electronic medical records shows the same results as manual data (Zheng, 2014).

Electronic medical records have shown benefits in preventing medical errors, more complete in recording of medical records, and facilitate surveillance. Electronic medical records are more effective than physical medical records.

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