Review

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Exploring Digitalizing in Health Care Records Impacting in Patient Safety

Mey Lona Verawaty Zendrato [1], Moh. Heri Kurniawan [2,3*], Gusrina Komara Putri [4], Cicilia Ika Wulandari [5]

[1] Department of Nursing, Universitas Kristen Krida Wacana, Jakarta, Indonesia
[2] Department of Nursing, Universitas Aisyiah Pringsewu, Lampung, Indonesia
[3] Research and Development, Hermina Hospital Group, Jakarta, Indonesia
[4] Departement of Nursing, Politeknik Karya Husada, Jakarta, Indonesia
[5] Institute of Health Science Sint Carolus, Jakarta, Indonesia

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Corresponding author:
Moh Heri Kurniawan,
Universitas Aisyah Pringsewu,
Moh.herikurniawan@gmail.com,

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Abstract

Background: Digitization on health care is a varied trend that tends to evolve. Technologically powered advances will not adequately satisfy the demands and desires of physicians and patients. This condition results in the emergence of poorly integrated approaches.
Aim: This Narrative review of the literature discusses (1) the advantages of digitalizing the healthcare sector for patient safety and (2) obstacles in achieving the benefits of digitalizing the health care.
Method: A narrative review of open-source literature from 2012 to 2018 was conducted by employing five repositories: PubMed, CINAHL, Science Direct, PMC, and ProQuest.
Results: The investigation of 41 full-text studies from the five repositories reveals six findings: 1) electronic health records and medication, 2) benefits for patients, 3) digitalized health data exchanges, 4) patient self-management based on EHR; 5) EHR data and cost reductions, and 6) data security.
Conclusion: The digitization of healthcare records particularly Electronic Health Records, improves the part security. Nonetheless, the empirical data is relatively weak, and it seems that the accuracy of the EHR, the implementation of the EHR, and the role of health care in the EHR primarily determine the success rates.

Keywords: EHR, digitization healthcare, patient safety.

INTRODUCTION

Patient safety is an imperative issue in health care. Patient safety is inseparable from the role of nurses in providing nursing care. Providing care to less safe patients will increase patient care time and cause increased funding. Medical error incidents in health services are still high. It is known that there are 67.8% of patient safety incidents and 3-16% of unexpected events in inpatient services in hospitals in various countries (Schwappach et al., 2016). Digitalization in health care is rapid growth. Health data are measured, stored, and exchanged in bits and bytes. Digitalizing health data have benefits as well as challenges for patient safety (Hariyati et al., 2016; Tellez, 2012). Digitalization of the health

care sector improves response time and reduces the risk of injury and morbidity (Kurniawan & Hariyati, 2019).

Recent evidence has demonstrated urgent and often unforeseen threats resulting from the use of EHRs and other uses of information technology in health (Harrington et al., 2011; Magrabi et al., 2012; Myers et al., 2011; Warm & Edwards, 2012). The rapid pace of development and application of EHR strengthens these issues. Therefore, together with the potential benefits of these programs, the particular safety risks raised by the use of EHRs should be addressed.At a phase when organizations are focused heavily on meeting "reasonable usage" criteria, they recommend providing better guidelines so that these entities may coordinate patient safety practices with the activities required to support a healthy EHR-enabled healthcare system (Radecki & Sittig, 2011). A series of EHR-specific security targets, based on the National Patient Safety Goals of the Joint Commission, may be necessary.

Implementation of EHR is still extremely heterogeneous across healthcare systems and suppliers, resulting in similarly diverse consequences for patient safety. For starters, patient safety goals in a company in the middle of an EHR deployment vary from those of an enterprise that has been using a fully integrated EHR program for 5 years or more (Dean F. Sittig & Singh, 2012). They suggest a three-phase model for the design of HER-specific patient safety goals to allow for the variability in implementation phases and degrees of sophistication across clinical practice environments. The first step of the system, addressing all EHR clients, but especially recent and potential adopters, contains strategies to reduce frequent and technology-specific risks (Kilbridge, 2003). The second phase addresses problems caused by inadequate use of technology or by mishandling of technology (Dean F. Sittig & Singh, 2012). The final phase focused on the use of software to track procedures and results in health care and identify potential safety issues before they can affect patients (Jha & Classen, 2011).The huge amounts of health-related data now being collected through healthcare providers with the aid of software remain distributed and not adequately used to enhance confidentiality and information protection in healthcare environments (Y. Wang et al., 2018).

OBJECTIVE

This review of the literature explains the advantages of digitizing health data for patient safety as well as a variety of obstacles in achieving such benefits.

METHODS

To identify relevant papers written between 2012 and 2018, they performed a literature review using the keywords 'electronic health record' or' patient safety' and' EMR' or' medical errors.' The criteria for qualification was to write the papers in English.

Figure 1 explains the literature review procedures' necessary steps. Based on earlier work (Ferrari, 2015), Step 1, which included using keywords to scan for posts, included the search methods. Phase 2 addressed the servers of the open source. As they provide health information, the researchers used PubMed, ScienceDirect, ProQuest, CINAHL, and PMC repositories. The terminology and keywords are introduced in Step 3, Step 4, and Step 5 selected the articles and removed any duplicates, respectively. Step 6 was a review of the full text and excluded an article if it was not related to the aim of the study.

Only the articles that met the study’s inclusion criteria were retained for full review: 1) the articles met the digitalizing and patient safety proposed by the authors; 2) included medication error, EHR, and EMR, and focused on patient safety; 3) English language; 4) The study included narrative reviews, commentaries, case studies, case series, surveys, clinical case studies, and RCT.

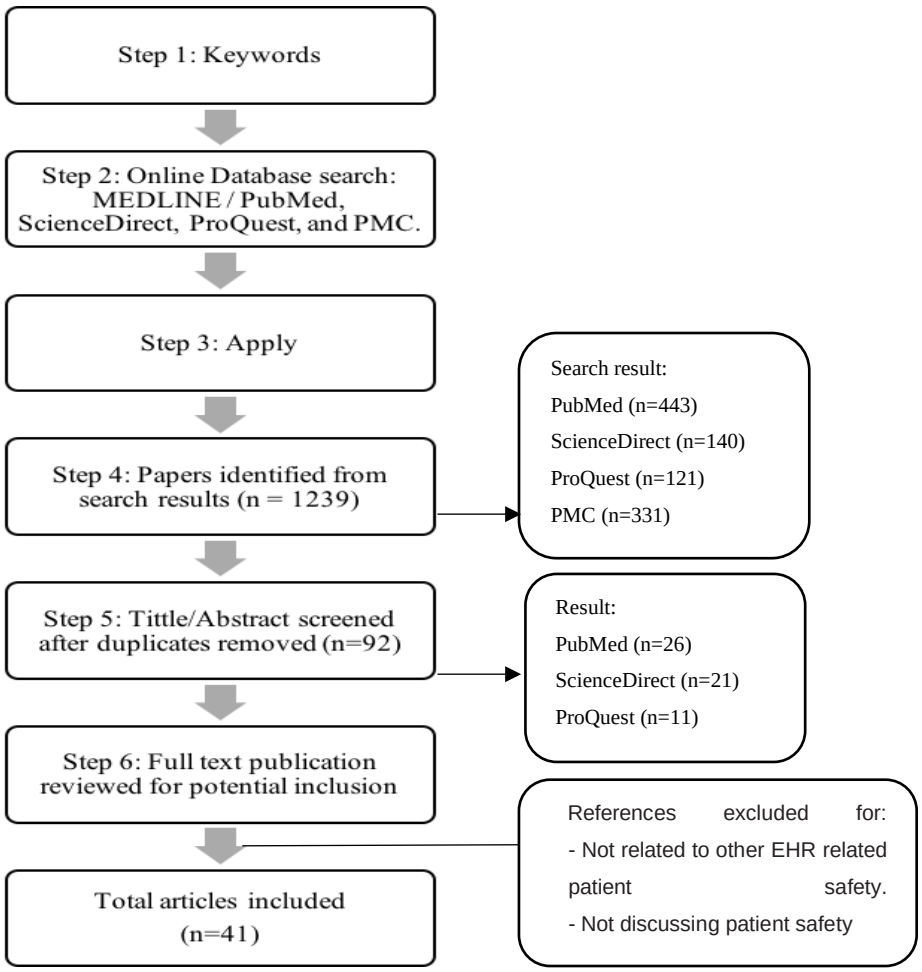

Figure 1. Literature search steps

RESULTS

A total of 41 full-text studies from all databases were used. Most of the articles that met inclusion and exclusion criteria and had been used in this review are exploratory research, either quantitative or qualitative study. According to figure 2, we were grouped into six categories. Six studies discussed EHR and medication such as EHR implementation (Han et al., 2016), combining EMR and Barcode Medication Administration (BCMA) (Truitt et al., 2016), hospital discharge(Peter et al., 2015), prescription (McMahon et al., 2017), adherence to medication treatment (Pfeifer et al., 2016), and medication alerts (Simpao et al., 2015). Seven papers showed EHR and its benefits for patients. These contained The care team identification in EHR (Dalal & Schnipper, 2016), EHR-based patient rounds (Carter, 2015; Raval et al., 2015), interventions based on EHR (Banerjee et al., 2016; Goldzweig et al., 2015), and the short term impact of EHR (Barnett et al., 2016; Thirukumaran et al., 2015).
Exchanging digitalized health data was shown in eleven studies. These contain EHR as a tool for communication with patients and other health care providers (Barbieri et al., 2018; Warner et al., 2016; Zhang et al., 2016), EHR as a tool to prevent admissions, readmissions and shorten the length of stay (Ben-Assuli et al., 2015, 2016; Singer & Duarte Fernandez, 2015; Zhang et al., 2016), Shared EHR to present full medication overview (Belda-Rustarazo et al., 2015; Rinner et al., 2015), EHR quality and quality of care (Moon et al., 2018; D. F. Sittig et al., 2016), combining databases (Lin & Schneeweiss, 2016).

Seven studies examined the impact on health care delivery, quality, and safety by supplying clinicians with links to their EHR general practice and associated online services (Mold et al., 2015). On the other hands, six papers showed that the development of EHR faces some problems (Benda et al.,

2016; Friedberg et al., 2014; Meeks et al., 2014; Ratwani, Benda, et al., 2015; Ratwani, Fairbanks, et al., 2015; Zahabi et al., 2015). EHR use is linked slightly to lower care costs regarding patient safety indicators (Shen et al., 2015).

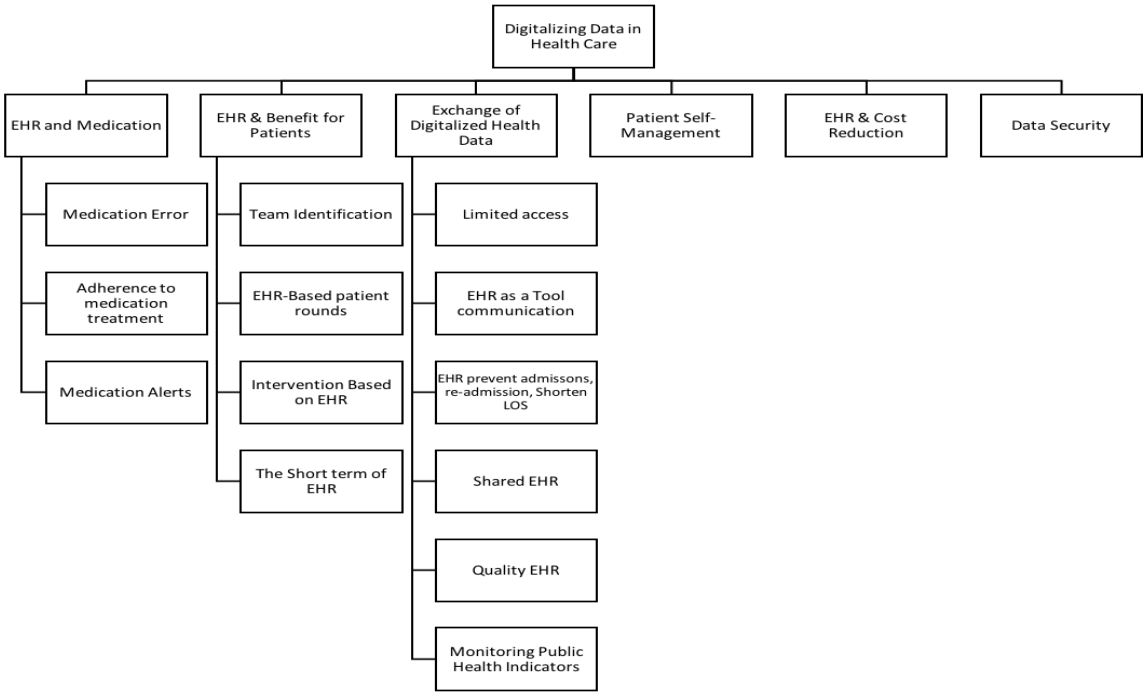

Figure 2: Key Findings of the Review

The data security measures include organizational safeguards, physical safeguards, and technical safeguards and are adopted by healthcare organizations to further secure confidential health information (Amer, 2015; Bey et al., 2013; Hunter, 2013; Jannetti, 2014; Kruse et al., 2017; Liu et al., 2015; D. F. Sittig et al., 2016; Tejero & de la Torre, 2012; C. J. Wang & Huang, 2013).

DISCUSSION

Electronic Health Records And Medication

Medication errors

EHR Implementation:

The implementation of the EHR culminated in a decrease in the occurrence of more significant prescription errors while there was a rise in less serious drug errors. Therefore, the implementation of an EHR reduced the risk of mortality after four and eight months, and the length of stay (LOS) at the MICU decreased significantly although the average stay at the hospital did not decrease significantly (Han et al., 2016).

EMR and Bar Code Medication Administration (BCMA) implementation combined:

A Barcode Medication Administration (BCMA) system is designed to avoid medication errors. A barcode wristband is given to all patients upon administration to the hospital. The nurses check both the watch and the barcode on the drug before offering a prescription. The BCMA system ensures that the nurse accurately administers the medication to the right person. Truitt et al. (2016) studied the impact on the frequency of adverse drug effects (ADE) in an American hospital of an integrated application of an EMR and a BCMA program. The application of these programs resulted in a decrease in transcription errors and a decline in ADE (Truitt et al., 2016).

Hospital discharge:

A medication error may also arise at hospital discharge, which increases the risk of readmission to the hospital or adverse events in medication. Peter et al. (2015) compared medication errors when

the history of medication was handwritten on a medication chart or electronically recorded in an electronic medical record (EMR). The percentage of prescription orders with a drug failure decreased when an EMR was used and the total number of medical errors per medication order decreased relative to the handwritten medication record (Peter et al., 2015).

Prescription:

Allergy alerts in the electronic medical record (EMR) can be enforced. McMohan et al., (2017) reported that an allergy to heparin was often misdiagnosed and a considerable amount of allergy alerts to heparin were therefore inaccurate. Many of these patients are treated with more expensive alternative parenteral anticoagulants (McMahon et al., 2017).

Adherence to Medication Treatment

Pfeifer et al (2016) implemented a standardized EMR medication guidance model to enhance compliance with perioperative medicines. Standardized medication guidance on the morning of the operation resulted in increased adherence to prescriptions (Pfeifer et al., 2016).

Medication alerts

A medication alert was introduced in the EHR to warn healthcare professionals about potential negative pharmaceutical reaction effects, over-and under-doses, and medication-drug interactions. These alerts can help improve the safety of patients. The amount of triggered notifications in the EHR is often high, and medically insignificant warnings are often sent to treatment professionals or pharmacists. This could result in warning tiredness and possible alarm ignoring or skipping and misunderstanding critical warnings. Simpao et al (2015) deactivated the medically unnecessary warnings resulting in a decrease in notifications and most likely a decline in the healthcare provider's warning load. The volume of overrides consequently decreased without an increase in drug security incidents (Simpao et al., 2015).

Electronic Health Records and Benefits for Patients

The care team identification in EHR

When clients are in treatment, care plans are developing, and medical staff is shifting over and over again. This can result in inconsistent patient information, the possibility of medical errors, suboptimal patient interactions, and higher costs. According to Dalal et al. (2016), accurate identification of the care team in the EHR is the first stage in mitigating these effects of inappropriate coordination because it is easy to find related colleagues (Dalal & Schnipper, 2016). Nonetheless, technological, regulatory, and social improvements will be needed in an enterprise to understand consistently accurate recognition of the care team.

EHR-based Patient Rounds.

At least 15 times are given to patients hospitalized for 3 days. This is a significant source of communication errors associated with (potential) adverse events that lead to injuries to patients. In a high-volume pediatric surgical facility, Raval et al. (2015) developed an EHR-based database of surgical hand-offs and rounding (Raval et al., 2015). This has resulted in increased accuracy, productivity, and perceived security. Carter (2015) also states that EMRs provide for the effective execution of surgical performance measures in ways that would not be feasible utilizing paper records (Carter, 2015).

Interventions Based on EHR

Some initiatives focused on EHR have been identified that could enhance clinical performance and patient safety as well as reduce costs. Goldzweig et al. (2015) announced that a computerized medical decision support system was introduced to allow clinicians to receive diagnostic imaging incorporated with the EHR (Goldzweig et al., 2015). The appropriate use of diagnostic radiology was improved moderately, and the overall use of such diagnoses was slightly reduced. Banerjee et al. (2016) showed that an EMR-based screening approach greatly enhanced the identification of discharged patients with a diagnosis of heart failure by their clinical team, as well as a lower readmission rate. Further inquiries are needed to determine if early identification of patients with heart failure can reduce readmission rates independently (Banerjee et al., 2016).

The short-term impact of EHR

Although acknowledging the enormous potential for that quality of care and patient safety, Thirukumaran et al. (2015) recorded a short-term decline in the quality of care during the hospital switch to EHRs. They suggest implementing effective execution plans to mitigate such consequences (Thirukumaran et al., 2015). On the other side, a comprehensive analysis intended to examine the possible short-term adverse effects of introducing a new EHR program reported no overall negative correlation with factors such as short-term hospital mortality, severe health conditions, or readmission (Barnett et al., 2016).

Digitalized Health Data Exchange

EHR used for communication with patients and other health care providers:

EHRs enhance communication if used strategically. According to Zhang et al. (2016) showed that both clinicians and the EHR process face requests from providers. To meet these requirements and provide patient-centered treatment, clinicians try to perform EHR practice beyond clinical experiences or build models for streamlining reporting research. Providers often seek to use the EHR to educate clients, create patient buy-in for use with EHR, and multitask between engaging with patients and using the EHR. (Zhang et al., 2016).

An American study reported that primary clinicians and pathologists had a communication gap in the EHR era. Pathologists have been ignorant of EHR-based correspondence systems (EHR-mail) and have never updated their inboxes, if ever. Clinicians believed that pathologists regularly checked their notes in the EHR because this was their primary mode of communication on medical problems with other physicians. Healthcare provider needs to be engaged because members of the medical team ensure sufficient contact with their colleagues (Barbieri et al., 2018; Warner et al., 2016).

EHR as a tool to prevent admissions, and readmissions and shorten the length of stay:

Implementation of EHR enhanced hospital care efficiency by reducing unnecessary admissions, shortening the length of stay, and reducing early readmission (Ben-Assuli et al., 2016). The EHR framework has facilitated better communication between practitioners and between doctors and patients, resulting in better continuity of treatment. Nonetheless, its performance benefit is not always reached (Ben-Assuli et al., 2015, 2016; Singer & Duarte Fernandez, 2015; Zhang et al., 2016)

Shared EHR to present full medication overview

Patient safety increased using shared EHR data. Shared EHR systems help to detect patients largely with alerts, and drug-drug interaction (DDI) is detected more frequently. Shared EHR systems can offer a medication overview of the prescriptions of different healthcare providers. Drug-drug interactions (DDI) and alerts for replication are often only reviewed by the healthcare provider who prescribed the medications. A national centralized electronic health records (EHRs) program can provide a detailed drug history for various healthcare providers' medications. In Austrian research, the development of a regional EHR resulted in an increase of 20 million in the number of people with extreme DDI alerts and a 17 percent increase in the number of DDI notifications and duplicates. Improving drug error detection may lead to improved patient safety (Rinner et al., 2015).

Belda-Rustarazo et al. (2015) noticed that reconciliation protocols for medicine are essential to reduce inconsistencies in the prescription and increase patient safety. It is crucial to consolidate patient health records across treatment rates, but not enough to prevent errors. During care transition points, more than half of prescription continuity failures emerge, primarily due to inadequate reporting of existing patient treatment. This may be due in part to poor communication between primary and hospital care and the absence of a full, accurate and available record of medicine (Belda-Rustarazo et al., 2015).

EHR Quality and Quality of Care

EHRs have been shown to improve communication and coordination between healthcare providers who are responsible for various roles within the same healthcare organization, resulting in reduced clinical errors/increased patient safety, enhanced interdisciplinary communication and collaboration, and a reduction in healthcare costs. Nevertheless, the EHR's complexity and the degree to which it is tailored to offer different viewpoints of different roles within the company may cause problems. While personalization has enabled hospital staff to focus on the information they need to fulfill their

various roles as healthcare professionals, new barriers have been created as a result of data incoherence. Optimization of EHR processes is characterized by prioritizing increasing requests with a predominant focus on improving the efficiency of EHR, building optimization teams or advisory groups, and standardization (Moon et al., 2018).

Sitting's research (2015) shows that many existing EHR-generated graphs from individual laboratory test results do not follow evidence-based standards to increase the interpretation of laboratory information. The way the information is depicted in the graph can contribute to an incorrect interpretation of the patient's condition and ultimately the physician's decisions (D. F. Sittig et al., 2016).

Combining databases

Databases for insurance claims have a monetary feature. Such repositories, though, typically contain demographic information, medical diagnosis, treatments, and use of prescriptions. Electronic health records (EHR) for each patient include personal medical information. Lin et al. (2016) investigated whether these repositories could be helpful in the study of drug research efficacy and security. The downside to connecting statements and EHR records was found to be that information performance, and completeness is not produced for research purposes. With these shortcomings in mind, however, Lin (2016) proposed that connecting statement data-keeping EHR information may boost the reliability of drug research studies (Lin & Schneeweiss, 2016).

Patient Self-Management

Study results indicate that patient experience has been increased by enhancing self-care. Digital access to health information and resources increased patient and health care provider interaction. But, with online services, most people would not be willing to pay. Patient safety has been expanded because physicians have been able to identify mistakes in their prescription database, and exposure to review reports has also improved recorded commitment to treatment. Clinician fears over increased workload have been partially understood. Email increased patient contact volume, but the increase does not appear to be sustained over time (Mold et al., 2015).

The transformation to EHRs has raised security concerns and increased discontent and pressure among clinicians (Friedberg et al., 2014). EHRs' unfortunate development is widely recognized as a significant source of these problems (Meeks et al., 2014; Zahabi et al., 2015). Most EHR services are not developed with a thorough understanding of the clinician's mental and perceptive needs (Ratwani, Benda, et al., 2015; Ratwani, Fairbanks, et al., 2015). Accordingly, the user interface, process within the HER, and the introduction of EHRs with medical procedures have culminated in safety hazards, inefficiencies, and general dissatisfaction during use (Benda et al., 2016). In-depth analyzes of how patients interpret and store information with patient knowledge in mind, manage and purpose and make decisions are often not part of the process of planning, creating, and enforcing EHRs (Ratwani, Fairbanks, et al., 2015).

EHR Data And Cost Reductions

Shen et al. (2015) analyzed the impact of EHR on the cost reduction of treatment. They used 366 hospital information for the analysis. The emphasis was on the expenses of acute care and general hospitals with short-stay discharge. We identified 11 patient safety metrics, e.g. estimated the cost of in-hospital pressure ulcer diagnosis, estimated the cost of post-operational hemorrhage and hematoma care, etc. No EHR program, a simple EHR system, and a robust EHR system were included in hospitals. The detailed EHR had an enhanced framework for judgment, which was not included in the simple EHR. Results from the research show some evidence that a higher level of EHR adoption is moderately associated with lower costs of care regarding patient safety indicators (Shen et al., 2015).

Data Security

The Security techniques contain administrative safeguards, physical safeguards, and technical safeguards, which are implemented by healthcare organizations to further secure protected health information (Kruse et al., 2017). Administrative safeguards focused on the compliance of security policies and procedures such as conducting audits, assigning a chief information security officer (CISO), and designing contingency plans (Amer, 2015; Jannetti, 2014; D. F. Sittig et al., 2016; Tejero

& de la Torre, 2012; C. J. Wang & Huang, 2013). Physical safeguards include administrative safeguard strategies in addition to the preservation of physical access to confidential health information by hardware and software access (Bey et al., 2013; Hunter, 2013; Liu et al., 2015). Technical safeguards refer to protecting the data and information system. This technique contains firewalls, virus checking, encryption, and decryption, as well as authentication measures (Liu et al., 2015; D. F. Sittig et al., 2016). These techniques proved to be the most promising and successful for ensuring Patient data privacy and security, as well as the protected health information contained.

CONCLUSION

This narrative review shows that there is some proof that the digitization of health care records, and in general the Electronic Health Record (EHR), have benefits that turn into improved patient safety. Nevertheless, the evidence provided by the research is relatively weak and the success rate tends to be determined largely by the reliability of the EHR, the application of the EHR, and the position of healthcare professionals in this. The strengths is original finding for accompanying studies to improve patient safety, and regarding the effectiveness of health care records, it is very qualified with current developments. The weakness about some of references more five years.

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