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The Benefits of Adopting Sustainable Electronic Health Records (EHR) for Healthcare Providers: A Systematic Literature Review

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Abstract: Electronic health records (EHRs) are being quickly used by healthcare global organizations. One of the primary goals of EHR implementation is to improve healthcare efficiency and workflow. Nonetheless, the effect of EHRs on healthcare efficiency and workflow is currently under investigation. Thus, the objective of this systematic literature review is to explore the impact of EHRs on healthcare efficiency and workflow improvement. A comprehensive search of four internet databases yielded 35 relevant articles published between 2017 and 2022. In terms of inclusion, 94 articles were initially identified from Scopus and Web of Science (WoS), and ultimately, only 38 articles were selected for this study based on abstract comparison. Then, in terms of exclusion, a further selection was made using the comparison of the introduction sections of each article, resulting in 35 articles being used in this research. The research was reviewed using a qualitative synthesis method, which enabled the identification of common themes and patterns. This systematic literature review adhered to the guidelines provided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). The number of participants in the articles based on geography is from 13 countries, with the highest total in the US, amounting to 19 articles, and the lowest at 1 article distributed across 7 countries. EHRs can improve healthcare workflow and efficiency in several ways, according to the findings of this study.

Keywords: benefit, EHRs, systematic literature review, technology adoption.

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INTRODUCTION

In the current post-pandemic, digitalization is needed to provide community and health services, one of the sectors that is an important sector for the current post-pandemic recovery. Electronic health records (EHRs) are the most fundamental component of health digital technologies (HIT), and their adoption rate in hospitals demonstrates the level of digitalization of medicine in a society (Liang et al., 2021). Modern HITs are replacing paper-based medical records to better manage patient information. Electronic health records (EHRs) can help physicians generate, store, and retrieve essential patient information, from medical histories to lab diagnoses, enabling high-quality care at diverse levels (Alanazi et al., 2020). EHRs will produce real-time information on

patient health information, which will contribute in accelerating patient action decisions and improve hospital services due to improved process efficiency (Adler-Milstein & Jha, 2017; Alsadi et al., 2022; Kim et al., 2017; Kutney-Lee et al., 2019; Levy et al., 2018; Sulaiman et al., 2018; Tarver & Menachemi, 2018).

The development of studies related to EHRs has been carried out in several developed and developing countries. According to Liang et al. (2021) studied to compare between US and China for EHRs adoption, he found adoption in US more attractive than in China due to financial support from US government through HITECH (Health Information Technology for Economic and Clinical Health) program and incentives for EHRs implementation. The healthcare industry has many regulations and standards that must be complied with by the health providers themselves, so that government intervention is needed to provide financial or non-financial support. However, supporting for implementation is not only from the government but also from the healthcare service or organization itself, which includes the willingness of internal technology to the staff who will use EHRs. Refer to Matthews (2017) despite increasing rates of adoption of EHRs, the impact of these technologies on the delivery of behavioral health services remains inadequately defined.

This research aims to address this gap in the literature. We systematically investigated and analyzed the contents of scientific papers from 2017 to 2022 on the benefits of hospitals adopting EHRs, as well as identified technological, organizational, and environmental aspect limitations in the adoption or implementation of EHRs. Governments, groups, and policymakers will gain a better knowledge of how to accelerate the adoption of EHRs and how to build technology-based policies in the healthcare industry based on the findings of this study. The remaining sections of this work are structured as follows. Provide an overview of EHRs in Section 2. Section 3 discusses the methods approaches adopted for SLRs. In Section 4, the findings are reported, followed by a discussion of these results in Section 5. This section discusses in depth the relevance of the findings of this study, as well as the limitations and scope of future research. The conclusion is discussed in the concluding section.

In the face of today's technological innovations, information grows quickly and, of course, benefits those who utilize it. In addition, technology is used to share society information, including in the sector of health. The availability of health information in hospitals is crucial for public safety (Holmgren et al., 2022). Therefore, a health information system, such as electronic health records, is required. EHRs can be roughly described as (in electronic format) longitudinal data acquired during normal health care delivery (Hertzum et al., 2021). EHRs offer opportunity to improve patient care, incorporate performance measurements into clinical practice, and allow clinical research (Esdar et al., 2019; Hansen & Baroody, 2020; Lite et al., 2020).

Legally, the information contained in EHRs is a record of the services provided to patients, and the hospital is permitted to store this information (Esdar et al., 2019). Refer to Hertzum et al. (2021) Typically, EHRs incorporate demographic, vital statistics, administrative, claims, clinical, and patient-centered information. Patients have access to and ownership of their electronic health records, and the data can be used by other medical facilities for later treatment purposes. EHRs evolved primarily to improve healthcare quality and record billing information (Wang et al., 2018). EHRs may be utilized to assess the feasibility of a study, facilitate patient recruitment, streamline data collecting, or conduct observational, embedded pragmatic, post-marketing randomized registry, or comparative efficacy studies. EHRs for the purposes of observational studies, safety monitoring, clinical research, and regulation. EHRs will increase the professionalism and efficiency of hospital administration. Patients and other stakeholders would appreciate the speed and ease of health services (Tarver & Menachemi, 2018). In addition, RME ensures that each unit operates in accordance with its roles, responsibilities, and authority.

Despite the optimistic connotations associated with the consequences of EHRs adoption on the digital transformation of the healthcare industry. Nevertheless, continues to be discussion regarding the advantages and legitimate service that expand beyond previously established predictions. A recent study says that despite the possibility that organizations will make substantial efforts in using EHRs technology to offer healthcare in the future, they will likely adopt a moderately pragmatic approach due to the widespread opinion that the benefits may be overestimated.

METHODS

This section discusses the study's research methodology. The purpose of the systematic literature review is to identify the benefits and barriers of EHRs adoption in healthcare. Systematic literature reviews are a method for summarizing scientific evidence to address a specific research question in a transparent and reproducible manner, while seeking to include all published information on the issue and evaluating the quality of this evidence (Lame, 2019). To conduct this systematic literature evaluation, we referred to the following guidelines: Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). Prior research identified Scopus and Web of Sciences as popular information sources for articles on health technology (Behera et al., 2019).

Tranfield et al. (2003) proposed an approach for systematic review of the literature with three key stages of analysis: Stage 1. Planning review: Identification and preparing proposal to review including development the protocol; Stage 2. Conducting review: Identifying select of research studies based on quality assessment for extraction and synthesis data; Stage 3. Reporting and dissemination; the outcome is report and recommendations with evidence.

Selected with consideration, all articles give data assessed relevant enough to be included in the review. The number of studies on the adoption of EHRs has grown rapidly due to the need to make good decisions in organizations. Thus, only articles published between January 2017 and August 2022 are included in the review. To assure quality, the authors exclusively select articles from journals indexed by Web of Science (WoS) or Scopus with Q1 and Q2 rankings. All chosen articles deal with the implementation of EHRs in healthcare. In addition, only English-written and published empirical studies and conceptual frameworks are included in this study. Other types of articles, such as meta-analyses and systematic reviews, were included.

Regarding the data collection process, the number of reviewers involved was not explicitly mentioned. However, it can be inferred that the data collection process likely involved multiple reviewers who worked independently to assess the eligibility of articles based on predefined inclusion and exclusion criteria. These criteria likely included relevance to the research topic, publication date, journal ranking, and article type. These tools could have aided in streamlining the data collection and analysis process, ensuring accuracy and consistency in the results.

In the initial stage of analysis, same or duplicate data are examined. In addition, the abstracts were evaluated according to the inclusion criteria. If the paper remains relevant, the methodology and discussion section are narrated and summarized. Excel and Mendeley are software programs used for pulling all detail information of articles. Figure 1 represents the SLR frame or flow that specifies the selection of articles from the database. In Step 1, 94 articles were identified (WoS, 20 and Scopus, 74) using simple syntax ("EHR* Adoption") Limited to articles published in English, peer-reviewed journals, and within the last 6 years (2017–2022). Registers and websites utilized specific healthcare-related registers and websites such as: World Health Organization (WHO) database, Healthcare Information and Management Systems Society (HIMSS), and etc. In Step 2, 19 articles

containing redundant data were eliminated from Q1 and Q2 consideration. Step 3 abstracts of the remaining 68 articles resulted in the exclusion of 30 articles assessed unrelated to the topic, leaving 38 publications. In Step 4, the introduction of each article was thoroughly compared to the inclusion criteria, resulting in the exclusion of three more articles due to inaccessibility of the entire document. Step 5 involved the selection of the remaining 35 articles that fulfilled the inclusion criteria.

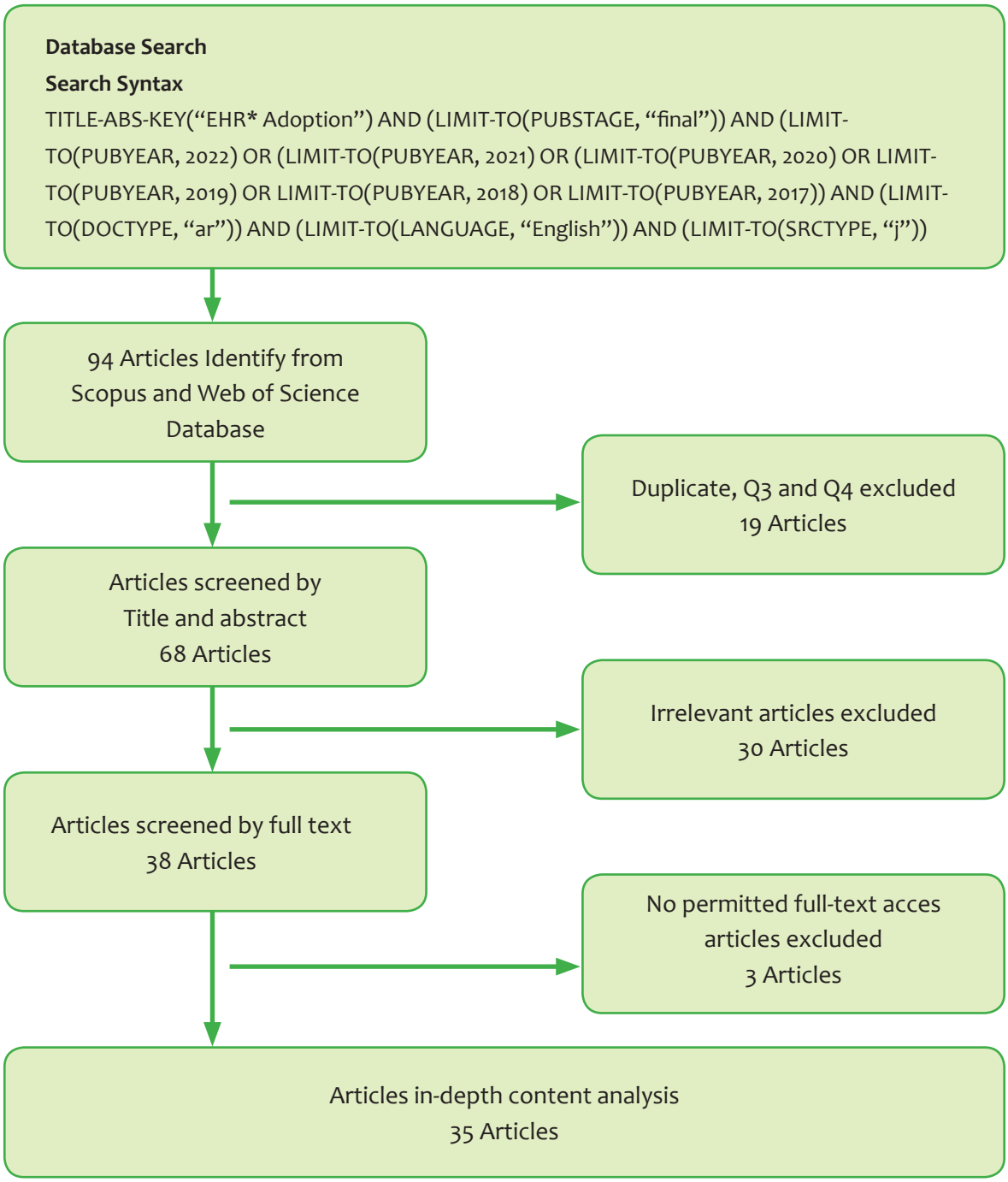

Figure 1 The protocol for a systematic literature review

RESULTS AND DISCUSSION

This research exclusively retrieved articles published in 2017–2022 from the Scopus and Web of Science databases. The screening and selection methodologies employed are subjective, raising concerns regarding potential selection bias. The objective of the descriptive analysis was to provide a preliminary result on the articles focused on the benefits and barrier of EHRs adoption implementation. Three viewpoints are defined for descriptive analysis of the chosen papers.

Studies that nearly met all inclusion criteria, but were ultimately excluded, include references (Affengruber et al., 2022). The specific reasons for exclusion are not provided in the search results. However, it is mentioned that one study reported false exclusions of up to 8% of studies due to uninformative titles and abstracts, and another study reported false exclusion of 11% of studies due to the non-English publication language. It is also noted that three studies reported on the characteristics of falsely excluded studies, including false exclusions due to uninformative titles and abstracts.

Paper by Years

According to the distribution of article publication years presented in Table 1, we recognize that the interest in the topic has increased from 2021 to 2022, and it indicates that 2022 (data through August 2022) will be a year with more papers published of EHRs adoption.

Table 1 Distribution of articles by years

Year	Articles	%
2022	4	11,4%
2021	4	11,4%
2020	6	17,1%
2019	7	20,0%
2018	7	20,0%
2017	7	20,0%

Distribution of the articles by Geographic coverage

Regarding the geographic scope of these research, the location was determined by the country or region from which the data was obtained (Table 2). Curiously, the United States is the most researched nation (Adler-Milstein & Jha, 2017; Asagbra et al., 2018; Bushelle-Edghill et al., 2017; Esdar et al., 2019; Everson et al., 2020; Gold et al., 2018; Hansen & Baroody, 2020; Holmgren et al., 2022; Hu et al., 2020; Kanakubo & Kharrazi, 2019; Kutney-Lee et al., 2019; Levy et al., 2018; Liang et al., 2021; Lite et al., 2020; Matthews, 2017; Spivak et al., 2021; Tarver & Menachemi, 2018; Wang et al., 2018). This is since the United States already has EHRs implementation standards and programs from HITECH and provide incentive from government. Future study may concentrate more on growth economies, whose infrastructure and legal rules are significantly distinct from those of industrialized nations and where corporations are increasingly committed in global competition.

Table 2 Distribution of articles by Geographic

Country	Articles	%
US	19	47,5%
South Korea	2	5,0%
Saudi Arabia	2	5,0%
Jordan	2	5,0%
UAE	1	2,5%
Switzerland	1	2,5%
Oman	1	2,5%
Norwegian	1	2,5%
Mexico	1	2,5%
Kuwait	1	2,5%
Kenya	1	2,5%

Improve Service Quality

The objective of hospital digital transformation is to increase the quality of health services, operational efficiency, and hospital management decision-making. Refer to Spivak et al. (2021) Urgently required is the improvement of data services in the treatment of substance use disorders (SUD) in the United States, hence EHRs is one approach since it can enhance service quality and address related demands and enhancements (Table 3). In realizing the use of EHRs, it is necessary to have an initial investment and ongoing operational costs to assess the ability of the system to produce increased work for data services in hospitals (Plantier et al., 2017). The implementation of the EHRs system focuses on operational efficiency that has an impact on patient health (Bushelle-Edghill et al., 2017). In order to increase the adoption of EHRs so that it is acceptable, a HITECH policy was made in 2009 which proves that the use of EHRs can improve the quality and care provided and is consistent in achieving the use of the policy (Adler-Milstein & Jha, 2017; Wang et al., 2018). For example medical professionalism, tourism sector managerialism, and regulatory oversight in the use of EHRs from data analysis (Hansen & Baroody, 2020). To achieve the goals of the 21st Century Cures Act and to improve quality and reduce costs broadly, there is a need for increased capacity of the EHRs to provide a robust list of community resources, and to document and track referrals to these resources (Gold et al., 2018; Levy et al., 2018). Examples of successes that have been implemented in China in the 2010 medical reforms resulted in the integration of medical resources, an increase in the popularity and quality of medical care, and a reduction in medical costs (Jabali, 2017; Liang et al., 2021).

Efficiency Delivery

There are still many healthcare providers that employ paper-based medical records as one of the methods for providing services to patients; hence, manual processes are still required when dealing with patients. The increase from the use of paper-based medical records to EHRs has many advantages, including improving the quality of information, increasing the speed and flexibility of access to medical records, as well as improving

the process for making decisions (Jabali, 2017). With this improvement, the adoption of EHR can assist firms streamline operating time, overcome organizational barriers, and operate as an instructional platform (Bushelle-Edghill et al., 2017). The successful implementation of the EHR System will contribute to health care quality, increase capacity in health care system services, and provide flexible services (Hossain et al., 2019). As a component of the work required to implement EHR, a convention must be held. This is done because it can help enable the use of EHR in psychiatry, which is highly important for fostering innovation in the use of EHR in psychiatry and enhancing the quality and efficiency of health care (Adler-Milstein & Jha, 2017; Kutney-Lee et al., 2019; Levy et al., 2018).

Table 3 Distribution of Benefit EHRs adoption

Benefit	Articles	References
Improve Service Quality	15	(Adler-Milstein & Jha, 2017; Bushelle-Edghill et al., 2017; Gold et al., 2018; Hansen & Baroody, 2020; Heart et al., 2009; Hu et al., 2020; Jabali, 2017; Levy et al., 2018; Liang et al., 2021; Matthews, 2017; Plantier et al., 2017; Spivak et al., 2021; Tarver & Menachemi, 2018; Wang et al., 2018)
Efficiency Delivery	9	(Adler-Milstein & Jha, 2017; Bushelle-Edghill et al., 2017; Hansen & Baroody, 2020; Hossain et al., 2019; Hu et al., 2020; Jabali, 2017; Kutney-Lee et al., 2019; Levy et al., 2018; Lite et al., 2020)
Improve financial performance	6	(Atasoy et al., 2018; Daley et al., 2020; Goldstein et al., 2019; Hansen & Baroody, 2020; Kutney-Lee et al., 2019; Lite et al., 2020; Wang et al., 2018)
Realtime Information Health Data	6	(Bushelle-Edghill et al., 2017; De Pietro & Francetic, 2018; Esdar et al., 2019; Gold et al., 2018; Hertzum et al., 2021; Jabali, 2017; Lee et al., 2018; Liang et al., 2021)
Improve patient safety	5	(Hansen & Baroody, 2020; Hossain et al., 2019; Hu et al., 2020; Kutney-Lee et al., 2019; Levy et al., 2018)
Improve Communication Process	5	(Bushelle-Edghill et al., 2017; Hansen & Baroody, 2020; Hu et al., 2020; Tarver & Menachemi, 2018)
Support patient engagement	4	(Esdar et al., 2019; Holmgren et al., 2022; Matthews, 2017; Zheng & Jiang, 2022)
Management Decision Making	5	(Castillo et al., 2019; Hu et al., 2020; Lee et al., 2018; Liang et al., 2021; Tarver & Menachemi, 2018)
Improve Clinical Process	3	(Goldstein et al., 2019; Kutney-Lee et al., 2019; Lee et al., 2018; Lite et al., 2020; Tarver & Menachemi, 2018; Vest et al., 2019)
Reduce Human Error	1	(Goldstein et al., 2019)
Standardization report and data	1	(Lite et al., 2020)

Improve Financial Performance

In several ways, EHRs may improve the financial performance of healthcare companies. Decreasing the expense of paper-based recordkeeping (Kutney-Lee et al., 2019). EHRs in healthcare organization no longer need to print, store, and maintain costly and time-consuming paper records. EHRs can facilitate participation in value-based payment systems by healthcare companies. These initiatives encourage healthcare professionals to provide high-quality, cost-effective treatment (Jabali, 2017; Wang et al., 2018). EHRs can facilitate the tracking and reporting of essential quality data, including as patient outcomes and satisfaction, which are used to decide compensation in value-based schemes (Daley et al., 2020; Goldstein et al., 2019). EHRs can assist healthcare

organizations in identifying and eliminating inefficiencies in their operations. By examining data on patient care and results, EHRs can assist physicians in identifying areas where efficiency can be increased, and costs reduced. The financial benefits of EHRs can be substantial, but it is crucial to recognize that these benefits may take time to manifest. Implementing EHRs may be expensive and time-consuming, and continuous maintenance and support are necessary to guarantee that the systems continue to perform as intended (Atasoy et al., 2018). With proper planning and administration, however, healthcare organizations may maximize their use of EHRs to enhance financial performance and patient outcomes.

Realtime Information Health Data

One of the objectives of EHRs is to replace the manual recording process on patient health records in order to eliminate patient data inconsistencies and produce accurate data in real time that is easily accessed by hospitals, clinics, and home care in order to integrate data between healthcare services (Bushelle-Edghill et al., 2017; De Pietro & Francetic, 2018; Hertzum et al., 2021). Accurate EHRs data in documenting patient data in EHRs is utilized in Social Determinants of Health so that it may be observed directly and which cannot be observed by outside parties in real time (Gold et al., 2018). In some cases, real-time data interchange is quite beneficial for action decisions about patients (Hansen & Baroody, 2020). Hence, based on studied, Discovered that EHRs cross-hospital data sharing and emphasis on clinical intelligent decision making fall into the high level 5 category for implementation EHRs (Liang et al., 2021). Real-time information on patient health data is important since it can provide historical insight on pharmaceuticals that have been supplied and awareness of the disease history of patients.

Improve Patient Safety and Improve Communication Process

The higher accuracy and completeness of medical records that EHRs enable healthcare providers to input and access electronically, hence minimizing the possibility of mistakes associated with handwritten or paper records. This may involve ensuring that patient information is current, comprehensive, and correct, which can help decrease the chance of drug mistakes, duplicate testing, and other harmful effects. EHRs have enabled healthcare providers to electronically share patient information, making it easier for them to coordinate care and interact with one another (Kutney-Lee et al., 2019). This can help prevent mistakes caused by misunderstanding or delays in communicating information, such as missed diagnosis or delayed treatment. for digital healthcare transformation EHRs as decision support tools because EHRs can incorporate clinical decision support tools that can offer healthcare practitioners with warnings, reminders, and other information that can avoid errors and enhance patient outcomes (Bushelle-Edghill et al., 2017; Levy et al., 2018; Tarver & Menachemi, 2018). For instance, decision support technologies can notify healthcare professionals about potential medication interactions, prompt them to arrange essential tests or procedures, and give clinical practice guidelines (Hu et al., 2020). By providing patients with access to their medical records, test results, and other health information, EHRs can promote patient involvement (Hu et al., 2020). This can assist people in better comprehending their health state, communicating with their healthcare professionals, and taking an active part in their treatment (Bushelle-Edghill et al., 2017; Hossain et al., 2019).

Support patient engagement

Patient engagement refers to patients actively participating in their own healthcare journey. EHRs may play a crucial role in enabling patient involvement and providing advantages to both patients and healthcare

professionals. Patients who are interested in their healthcare are more likely to take an active part in their health management. Patients who are given the ability to participate in their own care are more likely to follow treatment programs, engage in healthy habits, and report any changes in their condition (Matthews, 2017; Zheng & Jiang, 2022). Furthermore, EHRs can help patients and healthcare professionals communicate more effectively. A patient portal allows patients to access their health information, examine test results, and contact with their healthcare practitioner (Holmgren et al., 2022). Healthcare practitioners may decrease administrative responsibilities and free up time to focus on patient care by allowing patients to plan appointments, seek medication refills, and access their health information (Esdar et al., 2019). However, Patient portals may provide patients a sense of control and authority over their treatment, which can lead to improved overall satisfaction.

Management Decision Making

EHRs can support clinical decision-making by providing real-time alerts and reminders for providers, flagging potential drug interactions, and highlighting gaps in care (Castillo et al., 2019; Hu et al., 2020; Lee et al., 2018; Liang et al., 2021; Tarver & Menachemi, 2018). EHRs can also enable providers to access evidence-based guidelines and best practices, which can inform their decision-making processes. However, it is important to note that the relationship between EHR adoption and related decision making is complex and can be influenced by a variety of factors, such as the design and functionality of the EHR system, clinician training and experience with the system, and organizational culture and workflow.

Improve Clinical Process

Clinical process is the process involved in providing patients with healthcare services, such as evaluation, diagnosis, treatment, and follow-up care. It involves various healthcare providers, including nurses, physicians, and allied health professionals, and spans the whole patient care journey, from admission through discharge or follow-up. Refer to (Kutney-Lee et al., 2019) Utilize quality of care of EHRs were related to their work environment, which included nurse staffing levels and the availability of resources such as equipment and supplies. EHRs improves clinical processes for physicians in streamlining their operations, reducing mistakes, and enhancing patient outcomes (Hansen & Baroody, 2020). In other words, EHRs allow healthcare practitioners to rapidly and readily access patient information regardless of their location. This can increase the quality and completeness of health data and reduce the time necessary to search and access patient information. EHRs can assist healthcare professionals in coordinating treatment across settings and specializations. EHRs can assist guarantee that all members of a patient's care team have access to the same information, therefore minimizing the likelihood of mistakes and enhancing care coordination (Lee et al., 2018; Vest et al., 2019).

Standardization report and data for reduce human error

Standardization is critical for reducing human error in EHRs. Standardization ensures that EHRs are created consistently and uniformly, making it easier for healthcare practitioners to utilize and analyze the information in the system (Goldstein et al., 2019; Lite et al., 2020). Guidelines for the design and implementation of EHRs, including recommendations for user interface design, data entry, and documentation requirements, might be included in an EHRs standardization report. Best practices for training healthcare practitioners on the use of EHRs, as well as measures for maintaining continuing usability and user satisfaction, might be included in the study.

CONCLUSION

This paper proposes a systematic review of the impact of EHR's adoption in the healthcare industry. The main objective of this study is to identify the positive effects that hospitals get when developing new technology, especially on the development of EHRs. Afterwards, a comparison of the subjects and substance of each group was conducted to identify similarities and differences. The summary obtained from this study is that there are many positive impacts that will be obtained by hospitals and also patients due to the use of EHRs technology. For instance, improvement for quality services in hospital, It will be valuable for patient and hospital to increasing customer satisfaction. Our study has limitation, this study only collected article from 2017 to 2022 of Aug 2023 from Scopus and Web of Science only. The screening and selection processes are subjective, selection bias is an issue. To account for this, many researchers' viewpoints and consensus meetings were used. Because of the limited contextual information provided in the single studies and the heterogeneity in EHR criteria, several relevant research may have been ignored or eliminated. In addition to the absence of a quality analysis of the included publications, this review also exhibited a lack of standardization in the definitions of EHRs.

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