



# Bibliometric Analysis of Electronic Medical Records (EMR) Acceptance and Adoption: Trends, Insights, and Future Directions

Ananda Haris <sup>1\*</sup>, Qurratul Aini <sup>1</sup>

## Abstract

**Background:** The integration of Electronic Medical Records (EMRs) and Electronic Health Records (EHRs) has revolutionized healthcare by enabling digital storage, exchange, and management of patient information. This abstract explores the landscape of EMR acceptance and adoption through a bibliometric analysis of research literature indexed in Scopus from January 2014 to December 2023. The study identified 138 relevant articles focusing on EMR and EHR acceptance, employing tools like VOSviewer and Rstudio-Biblioshiny for data visualization and analysis. **Method:** This study is qualitative research with a literature study approach. The data collection technique in this study used Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) and obtained 138 documents for analysis. This dataset is converted to CSV format for further processing in Mapchart, VosViewer, and Rstudio-Biblioshiny for thorough analysis. **Result:** Key findings reveal a predominant focus on factors influencing EMR adoption, including technological infrastructure, user training, and regulatory mandates. The United States and Canada emerged as leading contributors to EMR research,

highlighting their advanced healthcare systems. Theoretical frameworks such as the Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT) were frequently employed to assess adoption determinants. **Conclusions:** The study identifies gaps in research, particularly in areas such as cybersecurity and user satisfaction, suggesting future avenues for investigation. By addressing these gaps, researchers can enhance the usability and effectiveness of EMR and EHR systems, thereby improving healthcare delivery and patient outcomes globally.

**Keywords:** Bibliometric Approach; Electronic Medical Records, Electronic Health Records, Acceptance, Adoption

## Introduction

The healthcare sector has undergone a significant digital transformation, with Electronic Medical Records (EMRs) at the forefront of this change. An EMR is a digital repository containing comprehensive reports on a patient's medical condition, history, examination results, medications, and treatments. Beyond these basic functions, EMR systems can also manage patient records, electronic medication histories, and even handle costing and payment processes (Anshari, 2019). A more advanced version of EMR, known as the Electronic Health Record (EHR), extends these capabilities by allowing secure storage and exchange of patient data, accessible to multiple healthcare providers. This supports sustainable, efficient, and quality integrated healthcare. While EMR and EHR systems both serve the primary function of recording

**Significance** | This study showed a comprehensive bibliometric analysis of EMR acceptance and adoption trends over a decade, emphasizing theoretical frameworks and global research patterns.

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patient information digitally, EHRs offer broader interoperability and data sharing (Anshari, 2019; Garets & Davis, 2006). With today's technological advancements, the health sector is rapidly evolving. Health services are no longer confined to the traditional doctor-patient relationship but have expanded into complex networks involving databases, hospital information systems, digital health records, online patient communities, and integrative systems (Belliger & Krieger, 2018, Md. Halimuzzaman et al. 2024, Zulfa et al. 2024, Qurratul Aini et al. 2024, Aini et al. 2024, Faris et al. 2024). Developed countries like the United States, Canada, the United Kingdom, Japan, and China have long implemented EMR systems (Chang & Gupta, 2015; Honavar, 2020). In contrast, developing countries are still in various stages of adoption. For instance, Indonesia has seen significant growth in EMR implementation over the past decade, driven by regulatory mandates such as the Ministry of Health Regulation No. 24 of 2022, which requires all health services to use electronic medical records by the end of 2023 (Ministry of Health, 2022).

Implementing an EMR system necessitates meticulous planning and the involvement of multiple stakeholders, focusing on user needs (Silvestre, 2018). The adoption of EMR systems enhances the quality and efficiency of healthcare services by streamlining patient record-keeping, improving clarity in medical record management, and reducing medical errors (Noraziani et al., 2013). EMR systems offer numerous benefits, including maintaining information confidentiality, reducing document loss risk, enhancing documentation quality, increasing information accessibility, improving provider communication, and achieving cost efficiency (Tsai et al., 2020).

However, the transition to EMR systems is not without challenges. Common barriers include limited resources, lack of training and technical support, and low levels of technological literacy and skills among users. Addressing these issues through user training and periodic evaluations can significantly improve EMR acceptance (Hakiem et al., 2022). Other negative impacts, such as low efficiency, increased workload, system inefficiencies, server crashes, and data security concerns, also pose significant obstacles to physician acceptance and system implementation (Amin et al., 2021). Factors like user fatigue, lack of self-efficacy, and user satisfaction further influence the successful adoption of EMR systems (Legesse & Berhanie, 2022; Tsai et al., 2020; Azmi et al., 2022; Wong et al., 2020).

This study aimed to conduct a bibliometric analysis to evaluate the trends in research on EMR acceptance and adoption among users and to trace the development of EMR-related studies. Specifically, this article examines the evolution of publications, key journal contributions, author impacts, citation counts, and geographic distribution of research by country. Additionally, it analyzes research topics through keywords and network visualization using

VOSviewer. The ultimate objective is to summarize the findings on EMR acceptance and adoption and provide recommendations for future research. This study is significant as it offers a comprehensive overview of the progression of EMR acceptance research over time, highlighting critical areas for future investigation.

## 2. Literature Review

The Technology Acceptance Model (TAM) was introduced by Davis in 1989 to assess user acceptance of new technologies. TAM consists of four constructs: Perceived Ease of Use, Perceived Usefulness, Attitude Towards Using Technology, Behavioral Intention to Use, and Actual Technology Use (Fayad & Paper, 2015). This model is an evolution of the Theory of Reasoned Action (TRA), introduced by Ajzen and Fishbein in 1980, which focuses on attitude toward behavior and subjective norms (Fayad & Paper, 2015). Extensive evidence supports TAM's validity in predicting technology acceptance, making it particularly relevant in healthcare settings (Yarbrough & Smith, 2007).

In 1990, Ajzen expanded on TRA with the Theory of Planned Behavior (TPB), adding the construct of Perceived Behavioral Control (PBC). PBC is influenced by control beliefs and perceived power, distinguishing TPB from TRA (Al-Suqri & Al-Kharusi, 2015).

Another prominent acceptance model is the Unified Theory of Acceptance and Use of Technology (UTAUT), developed by Venkatesh in 2003. UTAUT incorporates four constructs critical to user acceptance and behavior in the use of Information Technology: Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and Facilitating Conditions (FC). While PE, EE, and SI influence behavioral intention, FC directly affects the actual use of technology. UTAUT has been shown to have a stronger predictive power for user behavioral intent compared to TAM (Kim et al., 2015).

A study in Taiwan utilized TPB to analyze physicians' acceptance of EMR systems (Hsieh, 2015). Various research efforts have employed different theoretical models to measure the acceptance and adoption of EMR in healthcare settings, as summarized in Table 1.

The diversity of theoretical models underscores the importance of comprehensively analyzing EMR technology acceptance among users, especially physicians. TAM, UTAUT, and TPB all emphasize the Behavioral Intention to Use variable to explore its relationship with other constructs. This focus suggests that fostering a strong intention to use is crucial for the successful acceptance and actual use of new technologies.

## 3. Materials and Methods

This study employed a qualitative method with a literature review approach, specifically a bibliometric analysis to explore trends in

Electronic Health Record (EHR) literature indexed in Scopus. The data source was derived from the Scopus database in January 2024, using keywords "electronic health record" OR "electronic medical record" AND "acceptance" AND "adoption" for publications from the past decade (January 2014 - December 2023).

The data collection technique followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, with some modifications. The initial search yielded 242 articles. Screening was performed by focusing on subject areas such as Medicine, Computer Science, and Health Professions, and selecting only journal articles in English at the final publication stage. This refinement resulted in 138 documents. Figure 1 illustrates the identification and analysis process of the articles.

To visualize the research progress on EMR, various software tools were used. The process involved creating a keyword map by exporting search results from Scopus into CSV format and importing the data into VOSviewer and Rstudio-Biblioshiny software (Figure 1). Mapchart was utilized for visualizing the distribution of publications by country. VOSviewer facilitated network visualization, overlay visualization, and density visualization. In network visualization, concepts within a study are mapped, while overlay visualization tracks the progress of research studies. Density visualization helps identify densely researched areas and emerging themes/keywords.

Rstudio-Biblioshiny was employed to create visualizations such as the Three-Field Plot, Trend Topics, and Thematic Evolution. The Three-Field Plot shows relationships between three variables in bibliometric analysis, helping to understand connections among authors, keywords, and publications. Trend Topics analyzes the emergence of themes over time in scientific literature. Thematic Evolution in Biblioshiny identifies significant changes in research topics, highlighting major shifts in the focus of scientific research within the field.

## 4. Result

### 4.1. General Information and Annual Publication Output

Annual publication output refers to the number of scientific articles published annually by researchers or institutions, as indexed in the Scopus database. This metric provides insight into research activity and academic productivity at various levels, including individual researchers, research groups, and institutions. It is a valuable tool for evaluating the performance of these entities within the realm of scientific research.

Figure 2 illustrates the trend of publications on the topic of EMR acceptance and adoption over the past decade. The data indicates a sustained interest in this topic, with a notable peak in 2022, where 20 articles were published. Among these, eight studies focused on the factors supporting and hindering EMR implementation (Alsyouf et al., 2022; El-Yafouri et al., 2022; Kernebeck et al., 2022;

Liu et al., 2022; Mathai et al., 2022; Turan & Koç, 2022; van der Nat et al., 2022; Yoo et al., 2022). Other studies explored user satisfaction with EMR implementation (Al-Otaibi et al., 2022), cloud-data sharing deployments (de Oliveira et al., 2022), and the integration of Artificial Intelligence in neurology practice (Jones & Kerber, 2022).

In 2014, most studies concentrated on the acceptance and adoption of EMR/EHR (Bauer et al., 2014; Biruk et al., 2014; Johnson et al., 2014; Sunshade et al., 2014; Sharifian et al., 2014; Wylie et al., 2014). Five studies specifically investigated the acceptance and adoption of Clinical Decision Support in EHRs (Cho et al., 2014; L. McCullagh et al., 2014; L. J. McCullagh et al., 2014; Phansalkar et al., 2014; Sukums et al., 2015). By 2023, the research focus expanded to include mobile digital personal health (Ming et al., 2023), telehealth (Broffman et al., 2023), telemedicine (Zeltzer et al., 2023), and artificial intelligence (Stevens & Stetson, 2023). The years with the fewest publications were 2017 and 2018, with nine and eight articles respectively.

### 4.2. Distribution of publication by Country

The distribution of publications by country shows how scientific output is spread across different nations (Figure 3). This analysis highlights each country's contribution to the field and provides insights into global research trends, country-specific involvement, and comparative research performance.

The United States leads with 64 publications on EMR acceptance and adoption. Twenty-three of these studies examined the acceptance and adoption of EMR by physicians and nurses, including features like Clinical Decision Support within the EMR system. Additionally, studies on the psychosocial factors influencing EMR acceptance were conducted (El-Yafouri et al., 2022). Other research areas included the digitalization of telehealth systems, telemedicine, AI technology, and the mobile digitization of health services. The integration of Artificial Intelligence with EMR has been a focus in recent years (Jones & Kerber, 2022; Stevens & Stetson, 2023).

Canada follows with ten publications, primarily discussing EMR acceptance among doctors. Notably, two studies examined nurses' acceptance and satisfaction with EMR using the UTAUT theory (Maillet et al., 2015), which received the most citations over the past decade, and another using Social Cognitive Theory (Strudwick et al., 2016). One study explored EMR system acceptance for meaningful gender identity or transgender (Non-Binary Identities) (Bragazzi et al., 2022). The United Kingdom and Saudi Arabia each contributed seven articles to the literature on this topic.

### 4.3. Analysis Authors

Analyzing author contributions provides insights into individual impact on the scientific literature, collaboration dynamics, and trends in research production. Figure 4 highlights prolific authors in the field of EMR acceptance and adoption.

The most frequently published authors include Abdekhoda, Bates, Bush, Oliveira, and Tavares, each with three articles. Abdekhoda's notable works include integrating the Technology Acceptance Model (TAM) with organizational context variables in 2015. This study demonstrated that perceptions of usefulness (PU), ease of use (PEOU), management support, physician involvement, autonomy, and physician-patient relationships significantly influence physician attitudes towards EMR implementation, although training did not impact PU and PEOU (Abdekhoda et al., 2015). In 2016, Abdekhoda combined TAM and Diffusion of Innovation (DOI) theories, finding that perceived effectiveness (PU), PEOU, relative advantage, compatibility, complexity, and trainability affect physicians' attitudes towards EMR use (Abdekhoda et al., 2016). His 2019 study integrated the Technology-Organization-Environment (TOE) framework with TAM, revealing that perceived ease of use, perceived benefits, technological context, organizational context, and environmental factors significantly impact EMR adoption, supporting the TOE-TAM model's relevance (Abdekhoda et al., 2019).

Other frequently publishing authors include Abend (Molisani et al., 2023; Witzman et al., 2020), Ahmadi (Abdekhoda et al., 2015, 2016), Al Adwan (Adwan, 2017), Chiang (Bush et al., 2018; Bush, Connelly, et al., 2017), and Dehnad (Abdekhoda et al., 2016, 2019), each contributing two articles.

Table 2 shows that the most-cited EMR study is by Maillet, with 190 citations. Maillet's research analyzed EMR acceptance and adoption among nurses using the UTAUT theory. The study highlighted the importance of mediation roles in effort and performance expectations, emphasizing that EMR compliance with work practices, nurse values, and user work style are critical factors influencing nurse satisfaction (Maillet et al., 2015).

The second most-referenced study is by Kim et al., which examined factors influencing EMR adoption. The study found that performance expectations and user perspectives significantly impact the intention to use EMR systems. Frequent use of EMR for improving work efficiency and maintenance continuity suggests that workflow functions enhancing performance should be prioritized in EMR system implementation (Kim et al., 2015).

Hossain's study in Bangladesh investigated similar factors, revealing that performance expectations, effort expectations, and resistance to change did not affect doctors' behavioral intentions to adopt EHR systems. Conversely, social influences, facilitating conditions, and personal innovations in information technology did influence behavioral intentions. The study suggests that policymakers should enhance EHR adoption by developing social strategies that encourage peer motivation among clinicians and ensure the necessary technical support and training (Hossain et al., 2019).

#### **4.4. Relationship between references, author and keyword in Electronic Medical Record**

The Three Field Plot analysis provides a comprehensive view of the bibliographic data, illustrating the interconnectedness of references, author contributions, and keywords. This visualization helps in understanding the structure and dynamics of research contributions in the field of Electronic Medical Records (EMR).

In the left section of the plot, the reference structure is depicted. Each node or branch represents a specific category, source type, or topic relevant to the analyzed bibliographic data. The middle section highlights author contributions, showing the distribution of authors across various fields and their relationships. The right section visualizes the keywords used in the bibliographic sources.

Figure 5 shows that three of the top five contributing authors to this study heavily reference the Technology Acceptance Model (TAM) by Davis, the Diffusion of Innovation (DOI) theory by Rogers, and the Theory of Planned Behavior (TPB), an extension of the Theory of Reasoned Action (TRA) by Fishbein and Ajzen. The other two frequently cited works are Maillet's review on EMR acceptance among nurses (Maillet et al., 2015) and the study on Partial-Least-Squares (PLS) for Structural Equation Models (SEM) measurement by Götz et al. (Götz et al., 2009). The PLS method is particularly noted for handling both formative and reflective indicators in SEM, making it a valuable tool for theory testing due to its fewer requirements compared to covariance structure analysis while still providing consistent estimation results.

The authors with the most significant contributions to EMR acceptance studies—Oliveira, Tavares, Abdekhoda, Bush, and Bates—frequently use keywords such as electronic health record, technology acceptance model, health information technology, and electronic medical record.

#### **4.5. Linkage and Clustering of Themes in Electronic Medical Records**

Figure 6 displays a co-occurrence visualization of keywords, where the size and color of the circles indicate the extent of their integration within the bibliography and clusters, and the line lengths represent the strength of the connections. The visualization reveals four distinct clusters, each represented by a different color:

**Red Cluster:** Comprising keywords like electronic medical record, physician, health personal attitude, technology acceptance model, implementation, and healthcare quality.

**Green Cluster:** Featuring keywords such as electronic health record, adoption, behavior, expectancy, intention, education, satisfaction, and technology.

**Blue Cluster:** Including keywords like electronic medical record, physicians, health personal attitude, medical computing, and hospitals.

**Yellow Cluster:** Focused on age and age factors.

These clusters reflect groups of related entities based on their co-occurrence patterns, indicating topics frequently discussed together in the literature.

The analysis shows that frequently appearing keywords include electronic health records, electronic medical records, adoption, and technology. The adoption of additional clinical applications of EMR by hospitals can enhance the likelihood of EMR implementation by practicing physicians, fostering positive development patterns in EMR systems (Menachemi et al., 2009).

Other commonly appearing keywords are physicians, health, personal attitude, and perception. Understanding physicians' perceptions and attitudes is crucial for developing targeted education to showcase the benefits of EMR, thereby improving physicians' perceptions and further application of EMR (Lakbala & Dindarloo, 2014).

Conversely, keywords such as satisfaction, age factor, information system, and computer security appear less frequently and have fewer connections. This indicates that studies linking EMR with these topics are still relatively sparse, highlighting potential areas for future research.

#### **4.5. Overlay Visualization themes in the development of Electronic Medical Records studies**

Overlay visualizations provide additional insights into publication attributes over time, highlighting how research trends evolve. By applying overlay visualization by year, we can observe how networks have emerged or developed during specific periods.

In 2017, studies on EMR acceptance focused on personal attitudes, primary healthcare, information systems, and computer security (Figure 7). Understanding physicians' perceptions and attitudes has been shown to increase the acceptance and implementation of EMR (Lakbala & Dindarloo, 2014).

The following years saw a shift towards topics such as electronic health records (EHR), the Technology Acceptance Model (TAM), perception, physicians, and adoption. The use of acceptance model theories became more prevalent, with many studies employing TAM as well as other models like UTAUT and TPB. For instance, Abdekhoda combined TAM and the Diffusion of Innovation (DOI) theory to measure user acceptance of EMR implementation (Abdekhoda et al., 2016).

Recent studies have focused on behavior, expectancy, implementation, TAM, and satisfaction. One key measure of successful EMR implementation is the satisfaction of doctors as users (Azmi et al., 2022; Wong et al., 2020). Research in Kuwaiti hospitals examined psychosocial factors associated with physicians' use of EHRs and their satisfaction with the system. Findings indicated that the most significant factor influencing satisfaction was the perceived positive impact of EHR on physicians' work, followed by the ease of use of the EHR system (Al-Otaibi et al., 2022).

#### **4.6. Visualization of Trend Topics in EMR Research**

"Trend topic" analysis in Rstudio-Biblioshiny identifies popular themes within the bibliographic dataset (Figure 8). The size of each

circle represents the frequency of a topic's appearance, while the horizontal line indicates its temporal prevalence over the last decade. From 2016 to 2021, the topics of electronic health records and human factors were most frequently discussed. From 2020 to 2022, emerging trending topics included technology, documentation, and artificial intelligence.

#### **4.7. Density Visualization for Future EMR Research**

Density visualization in VOSviewer displays keyword density, with brighter colors indicating heavily researched areas and dimmer colors highlighting opportunities for new research (Figure 9) (Ajinegara & Soebago, 2022). Studies on physicians, adoption, perception, and health personal attitudes are well-covered. However, topics such as satisfaction, age factors, computer security, and specific aspects of the Technology Acceptance Model show less research density, suggesting potential areas for future investigation.

#### **4.8. Thematic Revolution in EMR Research**

The "thematic revolution" visualization in Rstudio-Biblioshiny illustrates significant shifts in research focus over time. From 2014 to 2021, major themes included human factors, physician studies, hospital information systems, major clinical studies, and mobile applications (Figure 10). In 2022 and 2023, the research focus shifted towards telemedicine, electronic health records, controlled studies, and broader healthcare and health outcomes. This thematic evolution reflects the dynamic nature of EMR research, adapting to new technological advancements and healthcare needs.

## **5. Discussion**

Of the 138 articles analyzed using keywords such as Electronic Medical Records (EMR), Electronic Health Records (EHR), Acceptance, and Adoption, the majority focus on the acceptance of EMR implementation driven by the demands of digital transformation in healthcare. Evaluating and examining EMR or EHR systems is crucial, as the findings can provide recommendations to enhance user acceptance. Research in this area typically explores the positive impacts of EMR systems, the factors influencing acceptance, and the obstacles that can affect the intention to use this technology. The need for a Health Information Exchange (HIE) that integrates healthcare data at the national level is becoming increasingly urgent. For instance, Indonesia's SATUSEHAT Platform serves as a health data exchange system that integrates digital health information from various service providers, policymakers, and insurers, facilitating a comprehensive national health information system (Ministry of Health, 2023). This integration underscores the importance of continued research to optimize the use of EMR and EHR systems.

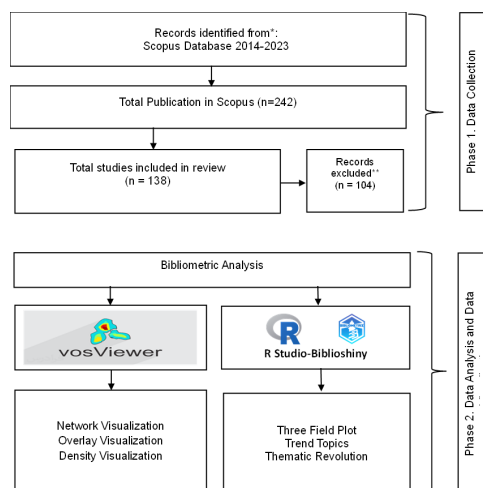
Different theories are employed to measure EMR acceptance or adoption, depending on the research focus. Theories such as the Technology Acceptance Model (TAM), Unified Theory of Acceptance and Use of Technology (UTAUT), Diffusion of

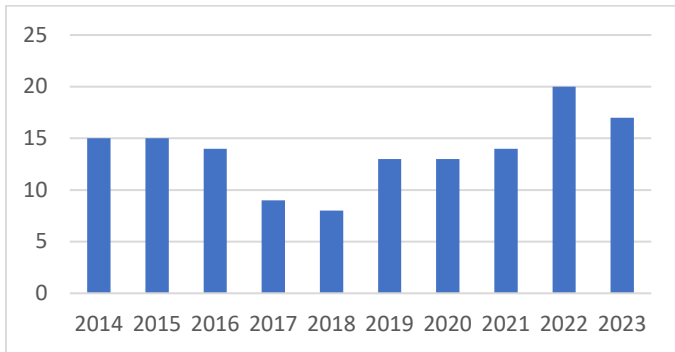
Innovation (DOI), or combinations of these, are commonly used. Understanding these theoretical models is vital for identifying the

**Table 1.** Review of Existing User Acceptance Models for Electronic Medical Records

Source: Authors analysis (2024)

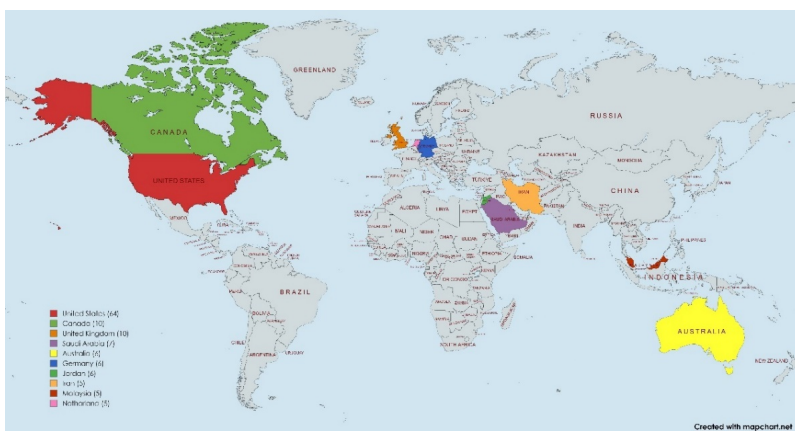
	Theory/ Type	Variables/Construct	Target	Sample Population
(Shiferaw & Mehari, 2019)	UTAUT	Performance Expectancy Self-efficacy Effort Expectancy Social Influence Facilitating Conditions Attitude Behavioral Intention Actual Use	Acceptance and Use of EMR system	Physicians
(Al-Otaibi et al., 2022)	TAM UTAUT	Quality of related training Perception of barriers to Use Effect of EHR use Level of ease of Use Satisfaction	Factors Contributing to Physicians' Current Use of and Satisfaction with EMR	Physicians
(Hwang et al., 2019)	TAM	Perceived Ease of Use Perceived Usefulness Clinical Specialty Financial Incentives	Effect of Gender and Clinical Specialty on Physicians' Intention to Use EMR	Physicians
(Maillet et al., 2015)	UTAUT	Performance Expectancy Effort Expectancy Social Influence Facilitating Conditions Attitude Behavioral Intention Actual Use Satisfaction	Acceptance, actual use and satisfaction of nurses using EMR	Nurse
(Aldosari et al., 2018)	TAM	Perceived Usefulness Perceived Ease of Use	Factor influencing acceptance EMR	Nurse
(Hsieh, 2015)	TPB	Attitude Subjective Norm Perceived Behavior Control Institutional Trust Perceived Risk	Physicians' acceptance of EMR exchange	Physicians





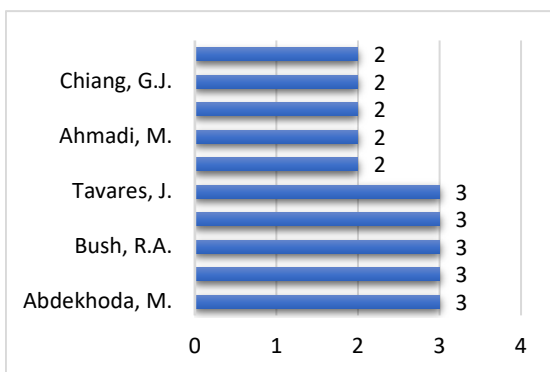
**Figure 2.** Global trends in publications on Electronic Medical Records (2014-2023).

**Source:** Adopted from Scopus database (2024)



**Figure 3.** Publication by Country.

**Source:** Authors analysis by Mapchart (2024)



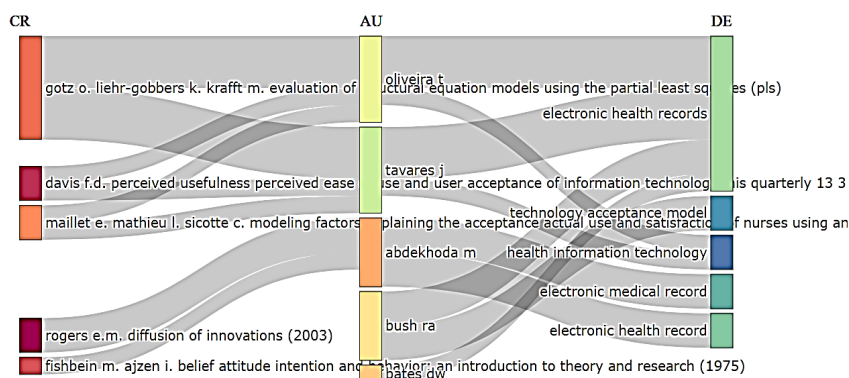
**Figure 4.** The Top 10 Most Active Authors.

**Source:** Adopted from Scopus database (2024)

**Table 2.** Most-cited publications in Electronic Medical Records

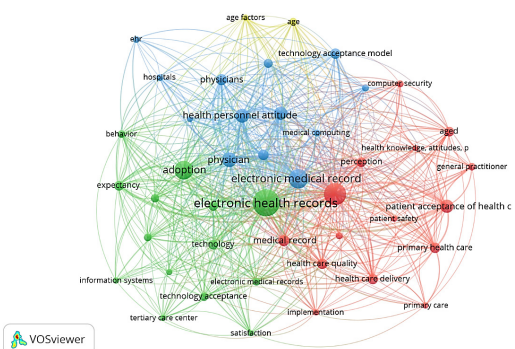
Author	Title	Source	Year	Citation
(Maillet et al., 2015)	<b>Modeling factors explaining the acceptance, actual use and satisfaction of nurses using an Electronic Patient Record in acute care settings: An extension of the UTAUT</b>	International Journal of Medical Informatics	2016	190
(Kim et al., 2015)	Analysis of the factors influencing healthcare professionals' adoption of mobile electronic medical record (EMR) using the unified theory of acceptance and use of technology (UTAUT) in a tertiary hospital	BMC Medical Informatics and Decision Making	2015	175
(Hossain et al., 2019)	Investigating factors influencing the physicians' adoption of electronic health record (EHR) in healthcare system of Bangladesh: An empirical study	International Journal of Information Management	2019	157
(Tavares & Oliveira, 2016)	Electronic health record patient portal adoption by health care consumers: An acceptance model and survey	Journal of Medical Internet Research	2016	126
(Abdekhoda et al., 2015)	The effects of organizational contextual factors on physicians' attitude toward adoption of Electronic Medical Records	Journal of Biomedical Informatics	2015	75
(Tavares & Oliveira, 2017)	Electronic Health Record Portal Adoption: A cross country analysis	BMC Medical Informatics and Decision Making	2017	45

Source: Adopted from Scopus database (2024)



**Figure 5.** Three Field Plot Visualization.

Source: Authors analysis by Bibliometrix



**Figure 6.** Co-occurrence visualization

Source: Authors analysis by VOSviewer



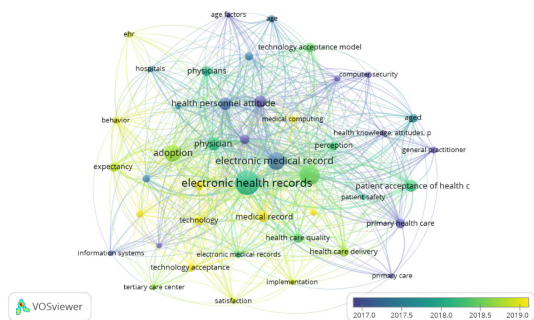


Figure 7. Overlay Visualization

Source: Authors analysis by VOSviewer

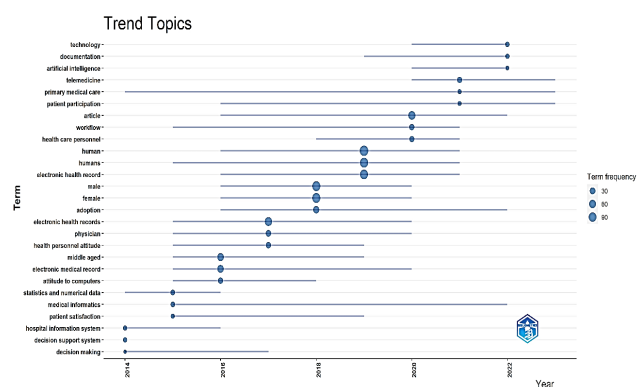


Figure 8. Trend Topic in Electronic Medical Record

Source: Authors analysis by Bibliometrix

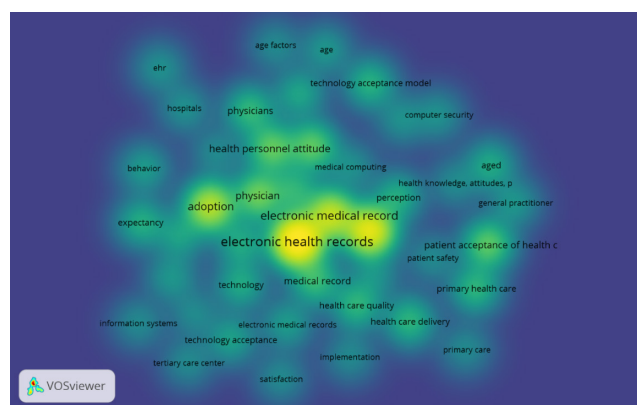


Figure 9. Future Research Visualization.

Source: Authors analysis by Bibliometrix

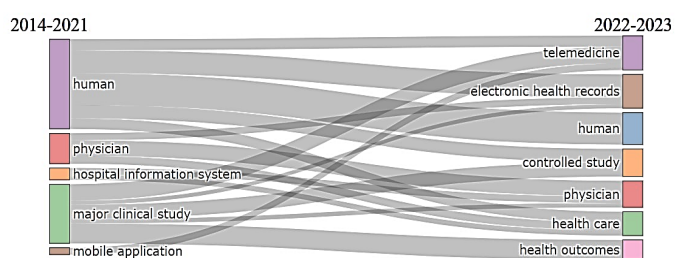


Figure 10. Thematic Revolution Visualization

Source: Authors analysis by Bibliometrix

factors that influence the intention to use EMR. Among the referenced studies, Maillet et al. (2015) on EMR acceptance among nurses stands out, highlighting a gap as most EMR acceptance studies focus on physicians.

Geographically, the United States and Canada are leading in EMR and EHR research. The United States began developing EMR systems in 1972, but their implementation remained low until the American Recovery and Reinvestment Act of 2009, spearheaded by Barack Obama, aimed to improve and increase their use (Honavar, 2020). In Canada, EMR implementation rates rose significantly from approximately 20% of practitioners in 2006 to 62% in 2013, facilitated by the establishment of the Canada Health Infoway (CHI) in 2001 to build a national infrastructure for health information exchange (Chang & Gupta, 2015).

Visualization tools such as VOSviewer reveal trends in EMR research over time. Early in the decade, the focus was on the acceptance and adoption of EMR. Over time, the trend shifted to EHR acceptance, the inclusion of features like Clinical Decision Support (CDS), and the rise of telehealth and telemedicine. Recent years have seen continued interest in telemedicine and telehealth, with growing attention to integrating Artificial Intelligence (AI) into EMR systems. Underexplored topics, such as computer security and satisfaction with EMR, present opportunities for future research.

In line with findings from Rstudio-Biblioshiny visualizations, these trends offer valuable insights into the evolution of research in this field. Emerging topics, particularly those related to telemedicine and AI in conjunction with EMR, reflect current technological advancements and provide a roadmap for identifying research gaps and planning future studies. These insights can help researchers focus on areas that have received less attention, thereby contributing to the development and implementation of more effective EMR systems.

## 5. Conclusions

The successful implementation of EMR and EHR systems in healthcare services hinges on high levels of user acceptance and adoption, which directly influence the intention to use these technologies. This study provides a comprehensive review and summary of research conducted over the last decade, focusing on the acceptance and adoption of EMR and EHR systems and the theoretical models used to measure these factors. By conducting systematic literature reviews, we identified relevant studies and summarized the evidence, utilizing VOSviewer and Bibliometrix software programs to analyze research trends.

Our findings showed valuable insights for journal readers and researchers, highlighting both current trends and emerging topics

in the field. Understanding these trends and the factors that affect EMR and EHR acceptance can guide the development of more effective and user-friendly systems. Moreover, the identified research gaps, particularly in areas like computer security and user satisfaction, provide opportunities for future studies. By addressing these gaps, researchers can contribute to the advancement of EMR and EHR systems, ultimately enhancing healthcare delivery and outcomes.

## Author Contribution

A.H. was responsible for designing the research proposals, conducting literature reviews, processing data, and creating data visualizations. Q.A. provided direction and guidance for the results and discussions, as well as the formulation of the research conclusions.

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## Competing financial interests

The authors have no conflict of interest.

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