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THE IMPACT OF ELECTRONIC MEDICAL RECORD USE ON DOCTORS IN HOSPITALS: SCOPING REVIEW

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ABSTRACT
Electronic medical records (EMR) are an information technology innovation that has been adopted in various health facilities to improve operational efficiency and quality of health services. In addition to its benefits, the use of EMR also presents a number of challenges for doctors in hospitals. This study aims to evaluate the positive and negative impacts of EMR use on doctors in hospitals. This study used a scoping review method using the PRISMA guideline, and produced 13 articles that met the inclusion criteria related to the impact of EMR on doctors in hospitals. The results of the study showed that EMR had a positive impact on improving efficiency, quality of care, and patient safety, but also increased the administrative burden. The use of EMR outside of working hours increases the risk of burnout and decreases satisfaction with work-life balance. In addition, doctor-patient interaction can be reduced, and concerns about data privacy reduce patient openness. Hospitals need to optimize workflows, provide comprehensive and ongoing training, delegate administrative tasks to non-clinical staff and develop more user-friendly EMR systems. This is important to ensure that EMR technology can support improved quality of care without sacrificing doctor well-being and interaction with patients.

Keywords: doctors; electronic medical records; hospital; impact

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INTRODUCTION

The digital transformation in the healthcare sector has revolutionized medical data management. One form of technological innovation in healthcare is Electronic Medical Records (EMR)(Intansari et al., 2023). EMR is a computer-based medical information system designed to collect, store, and display health information and clinical patient data digitally (Boonstra et al., 2021) (Rizky & Suhariadi, 2021). EMR encompasses both administrative and clinical documentation (Kemenkes, 2022). In several countries, including the United States, Denmark, and Australia, EMR has been used to replace paper-based systems, facilitating faster and more accurate access to information (Keshta & Odeh, 2021) & Odeh, 2021) (Pai et al., 2021). It supports medical decision-making (Hilhami et al., 2023), enhances the quality of patient care, and improves operational efficiency and healthcare service quality (Tsai et al., 2020). EMR is considered capable of streamlining medical recording processes, improving diagnostic accuracy, and reducing the risk of medical errors. Additionally, EMR facilitates easier and quicker access to patient data, enabling more effective clinical decision-making (Black et al., 2011) (Kruse et al., 2018).

Despite its potential, EMR implementation in various countries often faces challenges. In the United States, although financial incentives from the Health Information Technology for Economic and Clinical Health (HITECH) Act in 2009 have encouraged EMR adoption, physicians frequently encounter barriers, including system complexity and increased

documentation time (Lina et al., 2023) (Herfiyanti & Al-Islam Bandung, 2023). Similar issues are experienced in Indonesia, where EMR adoption remains uneven. According to the Ministry of Health, only a small proportion of hospitals have fully implemented EMR, with major obstacles including technological infrastructure limitations, insufficient human resource training, and lack of system interoperability (Intansari et al., 2023), (Hilhami et al., 2023).

Studies indicate that EMR implementation is often accompanied by significant challenges, such as increased administrative workload, particularly for doctors, as additional time is required for documentation, administration, and system interaction (Carayon et al., 2015) (Arndt et al., 2017). Other challenges include disruptions in medical team communication and resistance to change (Devin et al., 2021) (Calder-Sprackman et al., 2021) (Melnick, Harry, et al., 2020). Research reveals that doctors spend up to 50% of their time on administrative tasks, including EMR usage, thereby reducing the time dedicated to direct patient care (Veenstra et al., 2022), (Joukes et al., 2018). These effects impact not only efficiency but also pose risks to work-life balance and increase burnout rates among doctors (Veenstra et al., 2022), (Arndt et al., 2017). Additionally, the complexity of EMR usage and lack of integration between units can lead to job stress and even burnout among doctors (Melnick, Dyrbye, et al., 2020), (Vos et al., 2020). Insufficient training exacerbates work pressure, affecting job satisfaction and patient safety (Jamoom et al., 2014), (Muhiyaddin et al., 2022).

Intensive use of EMR, especially outside working hours, can increase burnout risk and lower satisfaction with doctors' work-life balance (Gardner et al., 2019). Other challenges include resistance to change, difficulties in learning, and system compatibility issues that disrupt clinical workflows (McGinn et al., 2011) (Jamoom et al., 2014).Therefore, this study aims to evaluate the positive and negative impacts of the use of RME on doctors in hospitals in order to optimize the implementation of this technology without sacrificing the well-being and clinical performance of health workers.

METHOD

This study is a literature review, which is a research and development method aimed at collecting and evaluating various studies relevant to a specific topic through a systematic approach. The stages conducted include:

1) Identification of Research Questions
   This study aims to evaluate the positive and negative impacts of Electronic Medical Records (EMR) usage on doctors in hospitals. The primary focus includes aspects of work efficiency, administrative burden, and doctors' work-life balance.
2) Data Search Strategy
   Data search was conducted using the databases PubMed, ScienceDirect, Cochrane Library, and Scopus with the keywords: "Electronic medical records OR EMR" AND "Impact" AND "Doctors" AND "Hospital." Boolean operators were used to optimize the results and ensure the keywords were relevant to the research objectives.
3) Eligibility Criteria
   The inclusion criteria for this study are:
   a. Articles in the form of scientific journals and/or proceedings.
   b. Articles from the specified databases.
   c. Articles published between 2014 - 2024.
   d. Articles utilizing primary data.
   e. Articles discussing the impact of EMR usage on doctors in hospitals.

   The exclusion criteria include:
   a. Articles in the form of reviews, opinions, or editorials.

b. Articles inaccessible in full text.
c. Publications in languages other than English or Indonesian.

4) Literature Selection Process

The initial identification process found a total of 758 articles. After removing 165 duplicates, title and abstract screening was conducted based on relevance to the topic, resulting in 593 articles. These articles were then assessed based on the inclusion criteria. A total of 580 articles did not meet the inclusion criteria, leaving 13 articles that fulfilled the criteria and were used for analysis. Subsequently, in the literature selection process, researchers utilized the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) method. Below is the PRISMA flow diagram used in this study:

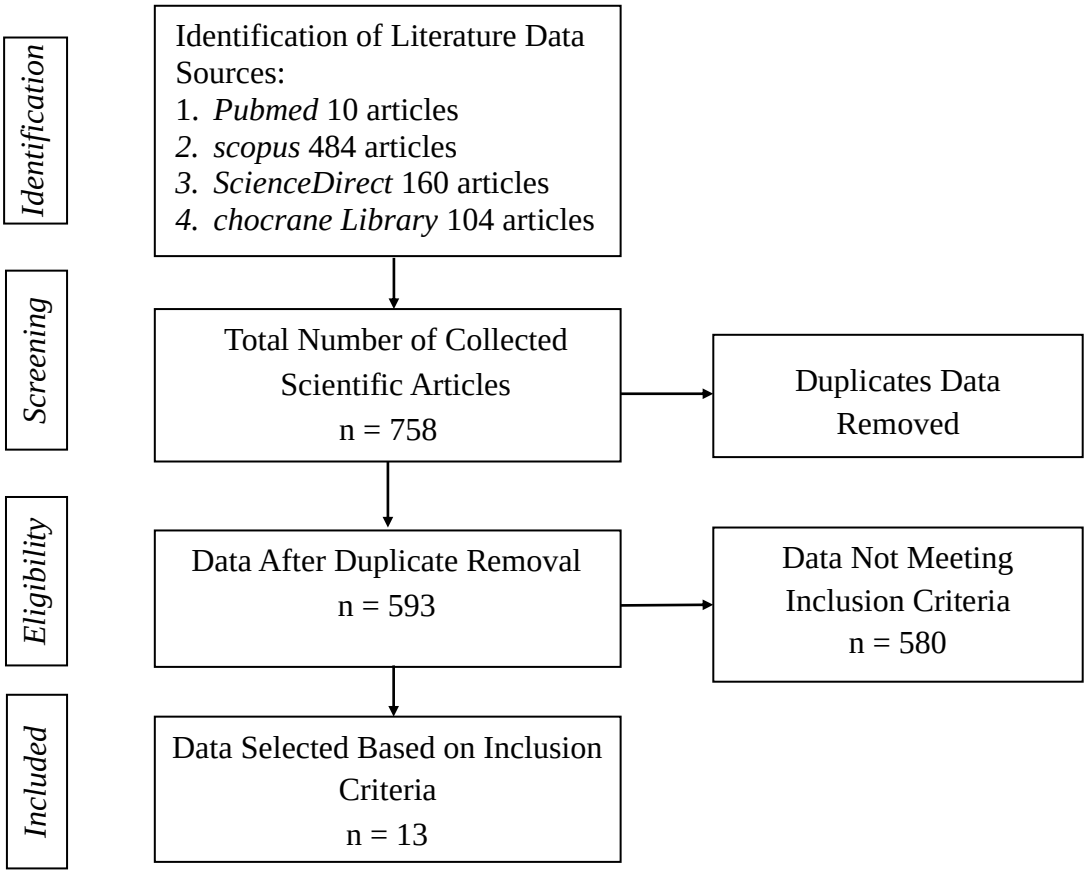

Figure 1. The PRISMA Flow Diagram

RESULT

Based on the application of the PRISMA method, the following results were obtained: out of a total of 758 journal articles and proceedings identified, 165 articles were excluded due to duplication. After this process, 593 articles remained and were further reviewed. However, among these, 580 articles did not meet the inclusion criteria due to various constraints. Consequently, only 13 articles successfully fulfilled all the inclusion criteria and were utilized as the primary materials for this literature study.

Table 1.
Literature Review

No	Title and author, year of publication	Method	Conclusion
1.	Sandy L. Robertson, *et al*, 2017 *Electronic Health Record Effects on Work-Life Balance and Burnout Within the I Population Collaborative (Robertson et al., 2017)*	Descriptive Quantitative	Positive Impacts 1. The use of EMR can improve job satisfaction and efficiency of doctors in handling patient information. 2. Better Data Access: The use of EMR provides faster and more organized access to patient medical records, which is useful for clinical decision making. Negative Impacts 1. EMR is one of the main causes of burnout in doctors. 2. Decreased Work-Life Balance of doctors. 3. High Administrative Burden causes an increase in the overall workload of doctors.
2.	Ming Tai-Seale, et al, 2017 *Electronic Health Record Logs Indicate That Physicians Split Time Evenly Between Seeing Patients and Desktop Medicine (Tai-Seale et al., 2017)*	Quantitative	Positive Impacts 1. Increased Administrative Efficiency by quickly accessing patient information and reducing time spent on manual recording. 2. Ease of Doctor-patient Communication 3. Better Care Coordination. Negative Impacts 1. Increased Digital Workload 2. Potential Burnout
3.	Joan Devin, et al, 2020 *Impact of an electronic health record on task time distribution in a neonatal intensive care unit (Devin et al., 2021)*	Quantitative	Positive Impacts 1. Reduced Task Interruptions, thus helping to improve work efficiency. 2. Time Efficiency in Information Search. 3. Improved Patient Safety by increasing Professional Communication and Reducing Contact with Patient Areas, thus reducing the risk of pathogen transmission. Negative Impacts 1. Increased Time for Specific Tasks 2. Possible Challenges in EMR Navigation. 3. Decreased Proportion of Documentation and Medication Time:
4.	Pascale Carayon, et al, 2015 *Impact of electronic health record technology on the work and workflow of physicians in the intensive care unit (Carayon et al., 2015)*	Observational pre-post	Positive Impacts 1. Increased Time for Direct Patient Care. 2. Efficiency in Administrative Documentation. 3. Ability to Analyze Task Flow. 4. Ease of Access to Electronic Data. Negative Impacts 1. Increased Documentation Burden on both

No	Title and author, year of publication	Method	Conclusion
			specialist and resident physicians. 2. Decreased Quality of Team Interactions 3. Changes in the way physicians perform their daily tasks.
5.	Eric W. Jamoom, 2014 *RME adopters vs. non-adopters: Impacts of, barriers to, and federal initiatives for RME adoption (Jamoom et al., 2014)*	Descriptive Quantitative	Positive Impacts 1. Increased Data Availability 2. Helps them provide better care 3. Increased Operational Efficiency 4. Increased patient data security 5. Savings on Administrative Costs 6. Saves doctors' time Negative Impacts 1. Disruption of Patient Interactions. 2. Increased Documentation Time. 3. Decreased productivity
6.	Brian G. Arndt, MD, 2017 *Tethered to the RME: Primary Care Physician Workload Assessment Using HER Event Log Data and TimeMotion Observations (Arndt et al., 2017)*	Quantitative	Positive Impacts 1. Improved Documentation and Data Tracking. 2. Ability to Analyze Data. 3. Reduces the need for in-person patient visits. Negative Impacts 1. Increased Workload 2. Fatigue and Burnout 3. Reduces the quality of face-to-face communication with patients.
7.	Erik Joukes, 2018 *Time Spent on Dedicated Patient Care and Documentation Tasks Before and After the Introduction of a Structured and Standardized Electronic Health Record (Joukes et al., 2018)*	Quantitative, observational pre-post	Positive Impacts 1. Improved Documentation Standardization. 2. Better Access to Information 3. Reduced Non-Patient-Oriented Work: Negative Impacts 1. Reduced Direct Patient Care Time. 2. Increased Documentation Burden. 3. Potential Shifting of Work Time
8.	Onur Asan, 2015 *How physician electronic health record screen sharing affects patient and doctor non-verbal communication in primary care (Asan et al., 2015)*	*cross-sectional design*	Positive Impact 1. Increased Patient Engagement. 2. Increased Accurate Documentation. Negative Impact 1. Passive Communication Disorder. 2. Reliance on Physician Communication Style.
9.	Ofir Ben-Assuli, 2014 *Electronic health records, adoption, quality of care, legal and privacy issues and their implementation in emergency departments (Ben-Assuli, 2014)*	*Qualitative Explorative*	Positive Impacts 1. Improved Quality of Care: 2. Supporting Clinical Decision Making 3. Data Interoperability. 4. Operational Efficiency. Negative Impacts 1. Security and Privacy Issues: 2. Implementation Difficulties: 3. Potential Workflow Disruption: 4. Lack of Conclusive Evidence on Quality of

No	Title and author, year of publication	Method	Conclusion
			Care:
10.	Celeste Campos-Castillo, 2015 The double-edged sword of electronic health records: implications for patient disclosure (Campos-Castillo & Anthony, 2014)	Descriptive Quantitative	Positive Impacts 1. Improved communication between patients and doctors. 2. Faster Data Access: 3. Ability to Analyze Data: Negative Impacts 1. Privacy and Security Concerns:. 2. Negative Impact on Patient Disclosure: 3. Perceived Technology Risk: Patients' perceptions of EMR, both symbolically and actually, can affect their trust and disclosure to their doctors. 4. Lack of Patient Understanding
11.	Linda M. Hunt, 2017 *Electronic Health Records and the Disappearing Patient (Hunt et al., 2017)*	Descriptive Quantitative	Positive Impacts 1. Quick Access to Patient Information: 2. Ease of Standardized Documentation: 3. Better Communication 4. Improved Quality Oversight: Negative Impacts 1. Shifting Focus from Patients: 2. High Administrative Burden: 3. Reduced Professional Autonomy. 4. Depersonalization of Patients:
12.	Gepke L. Veenstra , 2022 *Electronic health record implementation and healthcare workers' work characteristics and autonomous motivation- a before-and-after study (Veenstra et al., 2022)*	*Quantitative uncontrolled before-and-after study*	Positive Impacts 1. Increased Work Dependence 2. Increased Alignment with Professional Goals: 3. Support for Coordination. Negative Impacts 1. Decreased Work Autonomy: 2. Over-Dependence on Digital Systems: 3. Increased Autonomous Work Motivation: dependency 4. positive and negative cancel each other out
13.	Parvin Lakbala, 2014 *Physicians' perception and attitude toward electronic medical record* (Lakbala & Dindarloo, 2014)	Quantitative cross-sectional	Positive Impacts 1. Improved Quality of Care: 2. Operational Efficiency. 3. Improved Security and Data Management. 4. Supports Standardized Documentation: 5. Improved Patient Acceptance: Negative Impacts 1. System Complexity 2. Increased Training Time and Burden 3. Privacy and Security 4. Physician Resistance 5. High Implementation Costs.

DISCUSSION

The use of electronic medical records (EMRs) has become one of the key technological innovations implemented in various healthcare facilities to improve operational efficiency and service quality. However, despite offering numerous benefits, EMRs also pose significant challenges for hospital doctors. Based on a study employing a scoping review method following PRISMA guidelines, 13 articles published between 2014 and 2024 met the inclusion criteria and discussed both the positive and negative impacts of EMR use on doctors. Some of the positive impacts of using EMR on doctors in hospitals include:

1) Improved Administrative Efficiency
   Electronic medical records (EMR) provide physicians with the convenience of quickly accessing and updating patient information, reducing the time spent on manual record-keeping (Tai-Seale et al., 2017). In addition, EMR allows for measurement of time spent on various administrative and clinical activities, supporting work efficiency analysis and identification of areas for improvement (Robertson et al., 2017). EMR implementation has been shown to improve work efficiency by reducing time spent on administrative tasks and in-between activities, such as waiting or searching for physical files (Carayon et al., 2015). Cost savings are also seen, as EMR reduces the need for physical file storage and management, which is acknowledged by approximately 70% of physician users (Jamoom et al., 2014). The system increases medical practice productivity by 85.7% and speeds up decision-making with features such as prescription alerts and formulary management, which are appreciated by 96.2% of users (Lakbala & Dindarloo, 2014). EMR also helps reduce task interruptions by 75% for nurses and 87.5% for physicians, thereby increasing work efficiency (Devin). Time spent manually searching for patient files is drastically reduced; Before implementation, 20% of medication-related time was spent searching for files, whereas after implementation this task was almost no longer necessary (Devin). In addition, the electronic prescribing system in RME saves physicians time, with 77% of users reporting this benefit (Jamoom et al., 2014). Overall, non-clinical administrative tasks became more efficient, allowing physicians to focus more time on documentation and patient care (Joukes et al., 2018).
2) Ease of Communication
   Electronic medical records (EMDRs) make it easier for physicians to communicate with patients through a secure patient portal, enabling activities such as managing repeat prescriptions, reviewing test results, and providing medical advice (Tai-Seale et al., 2017). They also improve care coordination by facilitating digital recording and sharing of data between physicians and other members of the healthcare team, significantly increasing the proportion of physician time devoted to professional communication, from 15.4% to 26.0% (Devin et al., 2021). This improved communication not only improves efficiency but also contributes to patient safety. In some cases, when physicians actively discuss the benefits of the technology, relationships and communication with patients are strengthened (Campos-Castillo & Anthony, 2014)). In addition, direct access to medical records, such as lab results and consultation histories, supports more accurate, data-driven clinical decision-making(Hunt et al., 2017). EMR patient portals further enhance physician-patient communication through electronic prescription management and easy access to test results, making the medical process simpler and more convenient for all parties(Hunt et al., 2017).
3) Good data management and easy access
   Electronic medical records (EMDRs) allow for more structured management of patient data and quick access to medical information, such as progress notes, lab results, and prescriptions (Arndt et al., 2017). The use of EMRs provides more organized access to patient records, supporting more effective clinical decision-making (Robertson et al.,

2017). They also allow multiple members of the medical team to access patient records simultaneously, improving collaboration and speeding up the decision-making process (Carayon et al., 2015). Ninety-one percent of physicians using EMRs report that the systems make it easier to access patient data at the point of care (Jamoom et al., 2014). With more structured and standardized documentation, EMRs also improve data quality for clinical use and secondary purposes, such as reporting and auditing(Joukes et al., 2018). In addition, quick access to medical information through EMRs supports efficiency in the process of diagnosing and treating patients(Campos-Castillo & Anthony, 2014).

4) Data Analysis Capabilities
   Electronic medical record (EMDR) systems with activity log features allow for monitoring of time efficiency and identification of areas of work that can be allocated or delegated to administrative staff, reducing the direct burden on physicians (Arndt et al., 2017). Identification of significant administrative tasks through EMR also allows for more effective workflow customization and task allocation (Arndt et al., 2017). In addition, EMR supports flexibility and structure in workflows by making it easier for physicians to switch between tasks (Carayon et al., 2015). Structured data generated by EMR contributes to improved evidence-based care and better epidemiological reporting (Campos-Castillo & Anthony, 2014).
5) Improve doctor job satisfaction
   the use of RME can improve doctor job satisfaction and efficiency in handling patient information. (Robertson et al., 2017).
6) Improving patient safety
   The implementation of electronic medical records (EMR) significantly reduced the frequency of contact with the patient zone, by 46.2% for nurses and 60% for physicians. This reduction has the potential to reduce the risk of pathogen transmission, which is especially important for neonatal patients who are vulnerable to infection (Devin et al., 2021). In addition, by eliminating manual transcription tasks and reducing medication labeling errors, EMR contributes to improved safety in medication administration (Devin et al., 2021).
7) Improved quality of patient care
   A majority of electronic medical record (EMR) users, approximately 84%, stated that the systems provided significant clinical benefits, including helping them provide better care, with 71% of users agreeing compared to only 54% of non-users (Jamoom et al., 2014). EMRs support improved quality of care through quick access to comprehensive patient information, including retrospective, current, and even prospective data in some cases(Ben-Assuli, 2014). The systems are also associated with more complete and efficient documentation, which in turn supports better clinical decision-making (Campos-Castillo & Anthony, 2014). A majority of physicians (89%) agree that EMRs improve quality of patient care through more organized documentation and easier access to medical data (Lakbala & Dindarloo, 2014).
8) Improved data security
   Physicians who use electronic medical records (EMR) report significant improvements in patient data security, with 67% of users agreeing that the system is more secure compared to only 48% of non-users (Jamoom et al., 2014). Additionally, features such as prescription alerts and formulary management, which were appreciated by 96.2% of users, help reduce the risk of medical errors (Lakbala & Dindarloo, 2014). Overall, physicians reported that EMR not only improves data security but also helps minimize the potential for medical errors, thereby supporting safer and more efficient medical

practices (Lakbala & Dindarloo, 2014). Meanwhile, the negative impacts experienced by doctors in the use of RME include:

1) Increased Workload and Burnout

Doctors spend almost as much time on electronic medical record (EMR)-based administrative tasks, such as documentation and data management, as they do meeting directly with patients, which can increase work pressure (Tai-Seale et al., 2017). Time-consuming documentation, such as creating detailed medical notes, often becomes a major cause of physician burnout (Tai-Seale et al., 2017). On average, doctors spend nearly half of their workday—about 4.5 hours daily—on computers for administrative tasks like filling out billing codes, managing inboxes, and other documentation, with an additional 1.4 hours spent outside clinical hours. This brings their total work time to 11.4 hours per day (Arndt et al., 2017).The heavy reliance on EMRs contributes to work-life imbalance and significant levels of burnout, with 37% of physicians reporting burnout and 75% of them citing EMRs as a major contributing factor (Arndt et al., 2017) (Robertson et al., 2017). Physicians who spend more than 6 hours per week on EMR tasks outside clinical hours are three times more likely to experience burnout (Robertson et al., 2017). The complexity of EMR features and the need to handle various administrative tasks beyond official working hours further adds to doctors' workload (Robertson et al., 2017). Both resident and specialist physicians report a significant increase in time spent on clinical documentation, which exacerbates fatigue and work pressure (Carayon et al., 2015). In facilities that previously used paper-based medical records, EMR implementation even increased documentation time by up to 8.3%, confirming concerns that EMRs may amplify administrative burdens (Joukes et al., 2018). Moreover, the time spent meeting institutional documentation requirements often reduces meaningful clinical consultation time, as much of it is consumed by "clicking" or selecting complex diagnostic codes (Hunt et al., 2017).Campos-Castillo (2015) revealed that approximately 13% of patients withheld medical information from their physicians due to concerns about the privacy and security of data stored in EMRs. These concerns can compromise patient disclosure, which can ultimately impact the quality of care (Ben-Assuli, 2014) (Campos-Castillo & Anthony, 2014).

2) Decreased Work-Life Balance

53% of respondents reported dissatisfaction with their work-life balance, with 85% stating that their use of EMRs had a negative impact on this aspect. This dissatisfaction increased as the amount of time spent using EMRs outside of work hours increased, significantly reducing the likelihood of them being satisfied with their work-life balance (Robertson et al., 2017).

3) Disruption in Patient Interaction

A total of 52% of EMR users and 65% of non-users reported that EMR usage affects how they interact with patients (Jamoom et al., 2014). Doctors tend to focus more on the computer to meet administrative requirements, reducing direct interaction with patients. As a result, patients feel they are not receiving the doctor's full attention, which can, in turn, lower their trust in the medical care provided (Hunt et al., 2017).

4) Increased Documentation Time

The majority of physicians, both EMR users (76%) and non-users (77%), reported that EMR usage increases the time required to plan, review, order, and document care (Jamoom et al., 2014). In some cases, the introduction of EMR technology can even slow workflow due to the additional time needed for data entry and system navigation (Ben-Assuli, 2014). EMR adds to the time spent on administrative tasks such as inbox management, documentation, and prescription fulfillment, thereby reducing time available for clinical duties (Carayon et al., 2015) (Arndt et al., 2017).

5) Reduced Direct Patient Care Time
   Research shows that in facilities previously using older EMR systems, there was an 8.5% reduction in the time spent on direct patient care. This indicates that suboptimal EMR systems can negatively impact the efficiency of physicians' time in attending to patients (Joukes et al., 2018).
6) Security and Privacy Issues
   The transition from paper-based systems to digital formats presents challenges related to the security and privacy of patient data. Data stored on mobile devices or open networks is vulnerable to breaches or unauthorized access, which is a major concern (Ben-Assuli, 2014). This concern directly impacts doctor-patient relationships, as approximately 13% of patients reported withholding information from doctors due to insecurity about the privacy of their data managed through EMR (Campos-Castillo & Anthony, 2014). Fear of privacy risks can lead to patients being less forthcoming with their medical information, ultimately affecting the accuracy of diagnosis and the effectiveness of treatment (Campos-Castillo & Anthony, 2014).

CONCLUSION

The use of Electronic Medical Records (EMR) does provide many positive impacts, such as increased efficiency, quality of care, communication between doctors and patients, and patient safety, this system also has significant negative impacts. Increased administrative burden, risk of burnout, decreased patient care time, and disruption of personal interactions between doctors and patients are the main challenges that need to be overcome. Intensive use of EMR outside of working hours adds pressure to doctors' work-life balance, while concerns about privacy and data security can interfere with patient openness. Therefore, to optimize the positive impacts of EMR and reduce its negative impacts, a strategy is needed that includes optimizing workflows, delegating administrative tasks to non-clinical staff, comprehensive and ongoing training, and developing a more user-friendly EMR system. This is important to ensure that EMR technology can support improved quality of patient care and provide welfare for doctors.

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