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WHAT ARE THE BARRIERS TO THE IMPLEMENTATION OF ELECTRONIC MEDICAL RECORDS? A REVIEW OF RECENT STUDIES

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Abstract

Information technology utilization in the health sector is increasingly widespread. One aspect that cannot be separated from the intervention of information technology is medical records management through electronic medical records implementation. The number of healthcare facilities that implement electronic medical records is increasing. However, it is important to understand the various barriers that may be encountered in the electronic medical records implementation so that the success rate of implementation will be higher. This study aims to identify the current state of knowledge about electronic medical records implementation barriers. A literature review was conducted using three databases, PubMed, Science Direct, and Google Scholar using "electronic medical records" and "implementation barriers" as keywords. There were 13 articles used in this study. There are 8 categories of barriers to the implementation of electronic medical records which consist of technical concerns, initial and maintenance costs, security concerns, lack of technical support, user resistance, system interoperability capability, lack of infrastructures, and productivity concerns.

Keywords: *electronic medical record; implementation; barriers*

1. Introduction

Information technology utilization in health sector is increasingly widespread. The information technology application in health facilities includes developing algorithms or doing analytical process in the management and control process, decision making, and medical aspects review (Khodambashi, 2013). One aspect that cannot be separated from information technology intervention is the medical records management through the implementation of electronic medical records (Zhu & Hou, 2018). Electronic-based medical records have the potential to improve the health service quality, especially through the producing of quality health information (Manca, 2015).

The number of health facilities that implement electronic-based medical records is increasing (Perera et al., 2011; Kim et al., 2017).

Triggers for the increased adoption of electronic medical records are various benefits compared to paper-based medical records (Kernebeck et al., 2021), improving service quality, increasing patient satisfaction, and reducing clinical errors (Schenarts & Schenarts, 2012). However, it is important to understand the various obstacles that may be encountered in the electronic medical records implementation (Dornan et al., 2019). The more we know about the potential obstacles that will come, the more prepared we will be to face them so that the success rate of implementation will be higher.

This study aims to identify the current state of knowledge about electronic medical records implementation barriers. From this study, it is hoped that the various things that can become obstacles in the electronic medical records implementation could be identified in detail so that health service facilities that will implement electronic medical records will be more aware and can anticipate them from the start.

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2. Method

A literature study has been conducted to analyze the various barriers to the electronic medical records implementation based on the results of studies that have been published in the last 10 years. Articles were searched on three popular databases, namely Pubmed, Science Direct, and Google Scholar using the keywords electronic medical records and implementation barriers. The eligibility criteria for articles to be included in this study are using English, related to barriers to the implementation of electronic medical records, and published between 2011-2021.
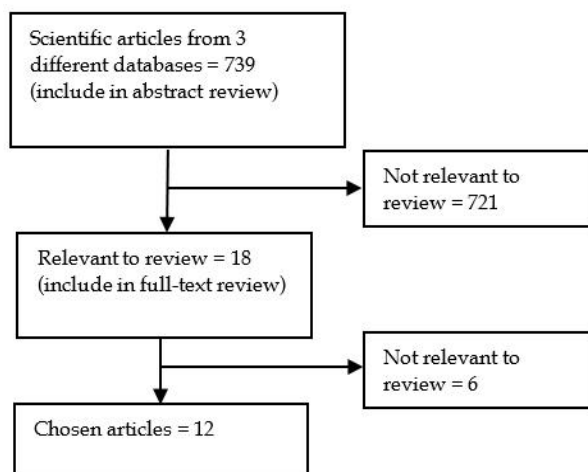

Figure 1. *Article selection process*

3. Result and Discussion

739 articles from all three databases were found. Based on the abstract review, 18 articles are relevant to the research topic then they were included in the full text review. Of the 18 articles, based on a full-text review, 12 articles were chosen for further analysis in this study.

Technical concerns

There are several technical concerns, such as a system that is not user friendly, a system that is too complex, and a system that is less responsive and less suited to user needs are obstacles in the implementation of electronic medical records. These technical concerns need to be anticipated from the start so that the implementation of electronic medical records was not hampered. Regular meetings, workshops to discuss all technical difficulties, and collaboration between hospital management and electronic medical records providers to ensure initial training and follow-up training to support electronic medical

records implementation are the key elements to anticipated the technical concerns (Ajami & Arab-Chadegani, 2013).

Initial and maintenance cost

The relatively large need for funds can be an obstacle in the electronic medical records implementation. Initial cost includes hardware procurement, software development and procurement, IT expert financing, training and assistance financing, and other supporting infrastructure financing in the implementation of electronic medical records. And about the initial cost, it is necessary to budget for maintenance costs which of course must have been budgeted since the implementation planning stage (Gesulga et al., 2017). Appropriate analysis and budget allocation is a solution to anticipate funding problems (Khalifa, 2013).

Security concerns

In the implementation of electronic-based systems, aspects of data security and confidentiality are always an important aspect to be discussed. The risk of data loss and data access by unauthorized parties is a concern for users. It is necessary to make guidelines or protocols related to data access rights, for example by determining the level of access rights in hospitals and limiting access to patient information outside the hospital (Jahanbakhsh et al., 2011). Blockchain technology can also be used as an option to be integrated with electronic medical records to ensure privacy an security aspects (Santoso et al., 2020).

Lack of technical supports

Technical support in the of electronic medical records implementation is a very important aspect. Lack of technical supporting team or slow response from the technical team regarding complaints from users will be a big obstacle in implementing electronic medical records (Kruse et al., 2016). Users who find difficulties or are dissatisfied with system performance will increasingly distrust the system's capabilities and consequently will no longer want to use the system if the technical team does not respond quickly. Therefore, preparing a reliable and responsive technical support team is a must before the implementation of electronic medical records begins.

Table 1. Studies on the barriers of electronic medical records implementation

No.	Author (Year)	Identified barriers
1	Ajami & Arab-Chadegani (2013)	Cost and benefits misalignment, privacy and confidentiality concerns, system interoperability, data standardization, lack of expert that lead the process, as well as the number and availability of vendors in the market
2	AlSadrah (2020)	Security breaches, loss of access to data in the event of a computer crash or power failure, time required to data entry and check its quality, technological complexity, potential for disruption of doctor-patient communication, lack of support and fast response from hospitals IT staff, and lack of training for health workers in using electronic medical records
3	Fennelly et al. (2020)	Organizational factors, human resources, and technology
4	Gesulga et al. (2017)	People resources (lack of skills and user resistance) and procedure resources (lack of policy and administrative support, and concerns about return on investment)
5	Greiver et al. (2011)	Lack of relative advantage, high complexity, and low compatibility
6	Gyamfi et al. (2017)	Staff commitment, initial cost, lack of expertise, and concerns about data and power back up
7	Jahanbakhsh et al. (2011)	Technology, culture, lack of needs analysis before implementation, privacy violations and legal cases, and interoperability aspects
8	Jawhari et al., (2016)	Lack of reliable electrical power, and sufficient preparation and support in the implementation process
9	Jung et al. (2020)	Lack of communication between government and health facilities, lack of system development environment, lack of infrastructure, poor implementation of standard terminology, user resistance, and poor system functionality
10	Khalifa (2013)	Human resources aspects (lack of awareness about the benefits of using electronic medical records), financial aspects (high initial costs), legal and legal aspects, technical aspects (lack of technical support), organizational aspects (lack of management support), and professional aspects (records). electronic medicine is considered to reduce productivity)
11	Kruse et al. (2016)	Initial cost, maintenance cost, technical concerns (difficulty, interoperability, complexity, errors, and inability to meet the user needs), technical support, and resistance to change
12	Palabindala et al. (2016)	Lawsuit, medication error risk, and the cost of implementation.

For hospitals that use vendor services, project contract details are important to note, especially regarding aftersales services (Ajami & Bagheri-Tadi, 2013). Make sure that the vendor has a structured and guaranteed aftersales service.

Table 2. The barriers of electronic medical records implementation

| EMR Implementation barriers	Reference study (No*)
Technical concerns	2, 3, 5, 7, 9, 11
Initial and maintenance cost	1, 4, 6, 10, 11, 12
Security concerns	1, 2, 7, 10, 12
Lack of technical supports	1, 2, 8, 10, 11
User resistance	3, 4, 9, 10, 11
Systems interoperability capability	1, 5, 7, 9
Lack of infrastructures	2, 6, 8, 9
Productivity concerns	2, 10

*see Table 1

User resistance

Users who are used to using conventional paper-based systems will likely have resistance when the system is changed to electronic-based. This resistance can come from the reluctance to move from their comfort zone so far. Lack of literacy related to information technology and unclear fears of new systems must be addressed first (Jung et al., 2020). Intensive training and mentoring activities can be a solution to this problem, of course the design of electronic-based medical records must also be made as simple as possible to make it easier for users to use it.

Systems interoperability capability

Interoperability is a capability that must be possessed by an electronic-based information system. The inability to communicate with other systems will be an obstacle in the implementation process (Greiver et al., 2011). This is because users have to use more than one system to input the same data which will certainly increase the user's workload. To anticipate this, in the system design stage, it must be ensured that the system built is

equipped with interoperability capabilities so that it can be easily integrated with other existing or future systems. We can set up an information services layer that consist of a data integration engine that allows data integration from multiple external data sources into the cloud system (Bahga & Madisetti, 2013). With this architecture, interoperability can be implemented with various systems originating from both external and internal hospitals.
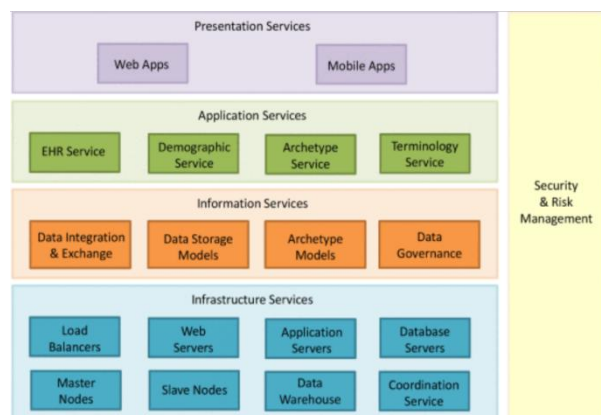
Figure 2. *Layered architecture of the proposed cloud-based electronic medical record (Bahga & Madisetti, 2013)*

Lack of infrastructures

The electronic-based information system implementation certainly requires a variety of supporting infrastructures. In relation to electronic medical records, infrastructures such as 24-hour electricity and fast internet access are major needs (Gyamfi et al., 2017). The absence or lack of such infrastructure will hamper the implementation of electronic medical records. Therefore, the supporting infrastructure needs to be identified and prepared in stages before the implementation of electronic medical records begins. Common infrastructure such as servers, computer networks and fast internet access must first be prepared, in addition to specific infrastructure such as medical imaging, telemedicine and interoperability capabilities.

Productivity concerns

One of the things that become a concern for users, in this case is health workers, related to the electronic medical records implementation is the reduced productivity due to the increased time that must be allocated to data input and check its quality (AlSadrah, 2020). These indicate the need for further study about complex socio-technical interactions between patient-clinician technology and other factors related to care and safety quality (Nguyen et al., 2013). Users feel that writing on paper will be faster and more efficient than entering data through a computer. Therefore, the electronic medical record system must be made as easy and simple as possible so that a user does not need a long time to adapt in using it. Even though the age of the user is also a factor that influences the intention to use the system (Bawack & Kamdjoug, 2018), with a simple user interface and an easy-to-understand flow, it is expected that the adoption process will be more quickly.

4. Conclusion and Suggestion

There are several papers that discussed about the barriers of electronic medical record implementation in the last 10 years. The barriers such as technical concerns, initial and maintenance costs, security concerns, lack of technical supports, user resistance, system interoperability capability, lack of infrastructures, and productivity concerns should be anticipated as early as possible before the implementation begins so that the implementation success rate will be higher.

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6. References

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