

Implementing Electronic Medical Records Through Big Data in Healthcare Facilities

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ABSTRACT

Accessibility of information is one of the main benefits of implementing electronic medical records in the world of health. Through electronic medical records, medical information can be accessed quickly, efficiently, and integrated by authorized parties, bringing positive changes in health data management. This study aims to determine the implementation of electronic medical records through big data in health facilities. The research method used a literature study using data based on EBSCOhost, Science Direct, Proquest, and Google Scholar. Inclusion criteria included: 1) Articles in Indonesian and English; 2) Full-text articles; 3) Articles published in 2017-2023. Keywords have been adjusted to Medical Subject Heading (MeSH), namely: "Big Data AND Electronic Medical Records". The retrieved articles were manually selected and reviewed from the title, keywords section, abstract, and the main context of the articles. The results of a literature study from the database showed that 5 relevant studies related to the implementation of electronic medical records through big data in health facilities have potential opportunities. Potential opportunities for the benefits of big data in health services are divided into 4 groups, including: 1) The quality of health services increased; 2) Supporting health workers in services; 3) Supporting research and scientific activities; 4) Management and business. The implementation of electronic medical records through big data in health services can provide potential opportunities including increased quality of health services, supporting health workers in services, supporting research and scientific activities, as well as management and business.

Keywords: Electronic Medical Records, Big Data, Healthcare Facilities

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INTRODUCTION

Better information accessibility is one of the main benefits of implementing electronic medical records in the world of health. Through electronic medical records, medical information can be accessed quickly, efficiently, and integrated by authorized parties, bringing positive changes in health data management. Improving the quality of patient care is one of the main benefits obtained through the implementation of electronic

medical records. This system not only simplifies the storage of medical information but also has a positive impact. Cloud computing technology, big data, and the Internet of Things (IoT) are currently the benchmarks for the existence of the Industrial Revolution 4.0. Information that is easy to obtain and easy to access at very high speed via the internet means that people can obtain information in real-time (Maryanto, 2017).

The term “Big Data” has recently been applied to data sets that grow so large it can reduce the work of using traditional database management systems. Big Data is a collection of data whose size is beyond the capabilities of commonly used software and storage systems, namely to store, manage, and process data in a short time. Efforts to achieve goals and overcome the challenges of health facilities in the era of globalization require the development of innovation in the delivery of health services that continue to adapt to developments over time and are expected to continue to improve over time. Several health facilities use Big Data from various sources to be effective in making daily predictions for health facilities, such as the number of patients expected to be in the health facility per hour. Apart from that, it is also useful so that nurses and hospital administrative staff to understand more about data science which is very beneficial for hospital operations (Ross et al., 2014; Tilaar & Sewu, 2023).

The implementation of electronic medical records as mandatory in all health facilities in Indonesia is regulated in Minister of Health Regulation no. 24 of 2022. This regulation explains that everyone must be connected to the SATU SEHAT platform with data standards set by the Ministry of Health. Changing paper-based medical records to electronic medical records can be used to support the preparation of evidence-based regulations. Apart from that, the integration of electronic medical records in each health facility on the platform can make it easier for patients and referral health facilities to obtain data on the patient's previous health history (Putri, 2023). The aim of this study is determine the implementation of electronic medical records through big data in health facilities.

METHOD

The research method used a literature study using data based on EBSCOhost, Science Direct, Proquest, and Google Scholar. Inclusion criteria included: 1) Articles in Indonesian and English; 2) Full-text articles; 3) Articles published in 2017-2023. Keywords have been adjusted to Medical Subject Heading (MeSH), namely: “Big Data AND Electronic Medical Records”. The retrieved articles were manually selected and reviewed from the title, keywords section, abstract, and the main context of the articles.

RESULTS

Table 1 Article Review

Authors (Years)	Aimed	Method	Results
(Batko & Ślęzak, 2022)	To analyze the use of big data in health services	Design: A Critical analysis of the literature Sample: The number of samples was 217 health facilities in Poland	The research results showed that there was a significant relationship between the size of medical facilities and the collection and use of structured data (p-value <0.001; α <0.05). It meant, the use of structured data in larger health facilities increased slightly. There was a significant relationship between the use of data and analysis systems to support clinical decisions (diagnostic and therapy) (p-value <0.001; $r = 0.22$; α <0.05).
(Ariyanti et al., 2023)	To identify the benefits of implementing electronic medical records based on the specified inclusion criteria	Design: A review method with the type of the PRISMA Inclusion Criteria: 1) Evaluation of the use of electronic medical records in hospitals; 2) Quantitative report on the use of electronic medical records; 3) Reports related to the use of electronic medical records; 4) Availability of journal information in Mendeley	The research results showed that the benefits of implementing electronic medical records were based on clinical aspects, economic aspects, aspects of access to clinical information.
(Baloch et al., 2023)	To find out trends and challenges of big data in health services	Design: A systematic literature review based on Kitchenham's concept Research Question: RQ1: What was the importance of big data in healthcare? RQ2: What trends have emerged since 2017? RQ3: What were the challenges and solutions to overcome these challenges? Article Review: The literature study was carried out using data based on ResearchGate, Google Scholar, Scopus, and IEEE Xplore published since 2017.	The used of big data in health services can reduce waste of human resources and improve services for patients through new systems (electronic health records). The challenge in the next 2 decades was to maintain health services by improving value creation, extracting linked features from health data, and data management. Big data in healthcare had great potential, but there were several problems related to this included governance, workforce shortages, privacy, data quality and costs.
(Deharja et al., 2023)	To analyze the factors that contribute to the	Design:	There was a significant relationship between information quality and

	<p>implementation of electronic medical records</p>	<p>A quantitative analytical with a cross-sectional design</p> <p>Sample:</p> <p>The total sample was 108 respondents including nurses, midwives, doctors, and medical records clerks. Data were analyzed using SmartPLS 3.2.9 with the PLS-SEM technique.</p>	<p>information satisfaction (p-value = 0.000; $\alpha < 0.05$).</p> <p>There was a significant relationship between information satisfaction and performance expectations (p-value = 0.000; $\alpha < 0.05$).</p> <p>There was a significant relationship between performance expectations and attitudes (p-value = 0.000; $\alpha < 0.05$).</p> <p>There was a significant relationship between social influence and performance expectations (p-value = 0.008; $\alpha < 0.05$).</p> <p>There was a significant relationship between facility conditions and attitudes (p-value = 0.032; $\alpha < 0.05$).</p> <p>There was a significant relationship between attitudes and overall satisfaction (p-value = 0.000; $\alpha < 0.05$).</p> <p>There was a significant relationship between overall satisfaction and net benefits (p-value = 0.000; $\alpha < 0.05$).</p>
<p>(Indira et al., 2023)</p>	<p>To assess the implementation of electronic medical records in hospitals</p>	<p>Design:</p> <p>A literature review</p> <p>Article Review:</p> <p>There was 15 articles obtained through data based on Google Scholar from 2016 to 2022.</p>	<p>The research results showed that several hospitals in Indonesia had implemented electronic medical records. Electronic medical records could to increase the efficiency of time and energy in providing health services. Additionally, patients also received better care.</p>

The results of a literature study from the database showed that 5 relevant studies related to the implementation of electronic medical records through big data in health facilities have potential opportunities. Potential opportunities for the benefits of big data in health services are divided into 4 groups, including: 1) The quality of health services increased; 2) Supporting health workers in services; 3) Supporting research and scientific activities; 4) Management and business.

DISCUSSION

The Quality of Health Services Increased

The research of Indira et al (2023), showed that several hospitals in Indonesia had implemented electronic medical records. Electronic medical records could increase the efficiency of time and energy in providing health services. The implementation of electronic medical records can increase efficiency and personnel in health services to patients. In

terms of time, the timeliness of electronic medical records helps in carrying out the task of serving patients appropriately and adequately so that patients receive treatment quickly. Big data in health services can improve patient care services and public health. In addition, the application of electronic medical records through big data can reduce the cost of patient care by means of precision medicine that transforms health services by adapting to the patient's genetic characteristics, thus opening up the potential for personalized care. Technology used to assist patients in real-time remote monitoring and early detection of potential patient health problems (Baloch et al., 2023; Indira et al., 2023).

Supporting Health Workers in Services

The research results showed that there was a significant relationship between information satisfaction and performance expectations (p-value = 0.000; $\alpha < 0.05$). The higher the satisfaction of information users with the system in general and information, the higher the performance expectations of health workers in implementing electronic medical records. It can be seen from the easy and fast access to the patient's complete health history so that it can help users provide better health services (Deharja et al., 2023).

Other research results also showed that there was a significant relationship between the use of data and analysis systems to support clinical decisions (diagnostic and therapy) (p-value < 0.001 ; $r = 0.22$; $\alpha < 0.05$). Big data enables the appropriate use of evidence-based medicine and helps healthcare providers make more informed decisions. This, in turn, improves the quality of services provided to patients. Remote monitoring, patient profile analysis, and genome analysis are other examples of applications that impact the Decision-making process (Kruse et al., 2016).

The research of Baloch et al (2023), the used of big data in health services can reduce waste of human resources and improve services for patients through new systems (electronic health records). Electronic medical records can reduce costs, workload and doctor error rates. Doctors and health workers also feel that the implementation of electronic medical records can improve the quality of service to patients and align with their daily routines. Another factor obtained is a more innovative culture and more bottom-up communication, making collaboration between multidisciplinary sciences easier (Agrawal & Prabakaran, 2020; Amalia et al., 2021).

Supporting Research and Scientific Activities

Big data research has opportunities in public health research. If used correctly it will have a beneficial impact, for example in making decisions about the right steps in treatment. But the use of big data requires a clear and transparent framework at various levels. The role of big data in precision public health can be used for disease surveillance and signal detection. Predicting public health risks leads to opportunities to implement preventive interventions, as well as identifying and understanding more about disease. The future of precision public health will be transformative. This will include new applications, modifications, and uses of current assets, including social media and communications

platforms, unmanned aerial vehicles, mobile applications, mobile sequencing, self-screening, sensors, internet-of-things or discovery of vaccines or cures (Dolley, 2018; Quiroga Gutierrez et al., 2023).

Management and Business

The research results showed that there was a significant relationship between social influence and performance expectations (p -value = 0.008; $\alpha < 0.05$). Social enhancement will influence increased performance expectations. Social influences, such as organizational policies, orders from superiors, or encouragement from coworkers can influence the implementation of electronic medical records and increase performance expectations. The trust given by leadership in an organization will increase performance expectations in the use of electronic medical records. On the other hand, low trust and weak influence from the environment due to a lack of strong policies and motivation will reduce performance expectations in the use of electronic medical records (Deharja et al., 2023).

The research of Ariyanti et al (2023), showed that the benefits of implementing electronic medical records were economic aspects. The benefits of implementing electronic medical records in the economic aspect are cost efficiency, cost savings and cost effectiveness. The implementation of electronic medical records can reduce the use of paper which previously used paper-based medical records and improve accuracy in service billing with the ability to record all requests for health services, medicines and human resources. Besides that, the implementation of electronic medical records can simplify monitoring and evaluation activities and increase organizational efficiency.

CONCLUSION

The implementation of electronic medical records through big data in health services can provide potential opportunities including increased quality of health services, supporting health workers in services, supporting research and scientific activities, as well as management and business.

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