
Cost and Benefit Analysis of the Implementation of the Electronic Medical Record System at PKU Muhammadiyah Banjarnegara Hospital

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Abstract

Background: The rapid advancement of information technology has transformed various sectors, including healthcare. In hospitals, the adoption of Electronic Medical Record (EMR) systems plays a strategic role in enhancing operational efficiency and service quality. This study aims to evaluate the cost efficiency and organizational benefits resulting from the implementation of an EMR system at PKU Muhammadiyah Banjarnegara Hospital. Using a qualitative comparative approach, this study analyzes cost components and incentives before and after EMR adoption. Data were obtained through observations, interviews, and reviews of financial documents. The findings show that EMR implementation generates substantial cost savings, particularly in data processing, archival storage, and administrative operations. In addition, the system improves transparency, workflow effectiveness, and the reliability of patient data management. These results emphasize that the benefits identified are financial and operational in nature, rather than related to office ergonomics or occupational health. In conclusion, EMR implementation not only enhances organizational efficiency but also offers a strategic solution for addressing operational challenges in healthcare institutions. Other healthcare providers are encouraged to adopt similar technologies to achieve optimal performance and cost-effectiveness.

Keywords: *Electronic Medical Records, cost efficiency, patient data management*

INTRODUCTION

The rapid development of information technology across various sectors has become a common phenomenon in today's digital era. In the healthcare field, the use of information systems has become a standard practice. Information systems have been widely adopted by hospitals, clinics, community health centers, and other healthcare facilities. This is because the use of information systems in healthcare services provides many advantages (Mukharram et al., 2024). One of the manifestations of technological and informational advancement in healthcare service management is the digital transformation that has fundamentally changed how patient information is stored and accessed. This phenomenon involves the widespread adoption of digital technologies, which not only transform how data is collected and processed but also create new dimensions in social interaction and present innovative business opportunities beyond sectoral and geographical boundaries. The Electronic Medical Record (EMR) is one form of technological advancement in the field of healthcare information (Yanti et al., 2024).

One aspect of national development is the improvement of healthcare services. Health development is an effort to enhance people's willingness, awareness, and ability to live healthily in order to achieve the highest possible health standard. Health is not merely the absence of disease and/or disability, but also a state of physical, mental, and social well-being. To achieve effective health development, it is necessary to improve the quality of primary healthcare services by strengthening hospital services. A hospital is a medical service facility where an organized team of professional medical personnel, supported by permanent healthcare facilities,

provides medical services, continuous care, diagnosis, and treatment for patients (Surya et al., 2024).

The Ministry of Health, as an extension of the government, has issued a new regulation requiring all healthcare facilities to implement Electronic Medical Records by December 31, 2023. In the local context, PKU Muhammadiyah Banjarnegara Hospital still relies heavily on paper-based medical records, which poses several operational challenges. These include high archival storage costs, frequent administrative delays caused by manual data retrieval, and the potential risk of lost or misfiled patient records. Such issues highlight the need for a more efficient and reliable information management system to support service quality and operational sustainability at the hospital. Based on this regulation, the implementation of EMR has a recognized legal basis that supports its development in Indonesia. Hospitals are encouraged to adopt EMR due to the expected benefits that can be obtained. The Electronic Medical Record plays a vital role for hospital management in addressing health-related issues, as it not only ensures data integrity and accuracy but also offers solutions for improving cost efficiency, as well as enhancing access and service quality in hospitals (Perwirani, 2023). Based on these statements, this study aims to analyze the costs and benefits of implementing the Electronic Medical Record system at PKU Muhammadiyah Banjarnegara Hospital.

RESEARCH METHODS

The method used in this study is qualitative analysis with a descriptive approach, where the qualitative method is a research method that examines problems comprehensively rather than only generally. This research was conducted at PKU Muhammadiyah Banjarnegara Hospital from May to July 2025. The sample consisted of two administrative staff members from the finance department and three staff members from the medical record unit, including the head of the medical record unit and two staff.

The research variables in the cost and benefit analysis of the implementation of the Electronic Medical Record (EMR) generally consist of independent and dependent variables related to the implementation of the EMR and its impact on costs and efficiency within the medical record unit or hospital (Hilhami et al., 2023). Independent Variable: The implementation of the Electronic Medical Record itself, which includes aspects of technology, system, and implementation processes. This variable influences the dependent variable and may include factors such as technological readiness, staff training, and the use of the Electronic Medical Record system (Hilhami et al., 2023). Dependent Variable: Cost savings and benefits obtained after the implementation of the Electronic Medical Record, such as reductions in expenditures for office supplies, employee salaries and overtime, as well as other operational costs in the medical record unit. This variable may also include the measurement of cost-effectiveness analysis (cost-benefit analysis) of the EMR implementation (Hilhami et al., 2023). The operational definition of the research was shown in Table 1.

Table 1.
Operational Definition of Research

Variable	Operational Definition
Cost Analysis Before EMR Implementation	A comprehensive evaluation of all expenditures and potential financial impacts that may occur before a hospital adopts the Electronic Medical Record system.

Cost Analysis After EMR Implementation				An evaluation conducted to assess changes in costs that occur after the Electronic Medical Record system is implemented in the hospital.
Employee Incentives Before EMR Implementation				Forms of rewards or additional compensation provided to hospital employees as an effort to increase motivation, performance, and productivity in carrying out administrative or service tasks before the implementation of a digital system such as the EMR.
Employee Incentives After EMR Implementation				Forms of rewards or additional compensation provided to employees, particularly healthcare and administrative staff, as an appreciation for their adjustment, adaptation, and contribution in supporting the transition and operation of the EMR system in the hospital.
Office Supplies Expenditure Before EMR Implementation				All costs or funds spent by the hospital (or health centers) to purchase manual administrative equipment used in recording and managing patient data physically or on paper.
Office Supplies Expenditure After EMR Implementation				The costs incurred by the hospital to meet administrative needs that still require the use of stationery or office supplies, even though most of the recording and data management processes have been shifted to a digital system.
Indicators or Measurement Tools for EMR Implementation				Indicators or criteria used to assess the extent to which the Electronic Medical Record system has been implemented effectively and efficiently in the hospital.

Data collection methods used in this study include interviews, observations, and documentation. Structured and direct interviews were conducted by asking questions to finance and medical record officers at PKU Muhammadiyah Banjarnegara Hospital. Direct observation was carried out to identify factors affecting the costs and implementation of the Electronic Medical Record at the hospital. Documentation was used to record and preserve the data collection process conducted by the researcher at the study site. Data analysis in this study is based on qualitative analysis methods to transform raw or initial data into relevant information. Therefore, data analysis is an essential step in converting unprocessed data into meaningful and relevant information using qualitative methods. Qualitative descriptive analysis focuses on interpreting non-numerical data to describe characteristics, patterns, and relationships among the elements in the study (Susanto et al., 2024).

RESULTS AND DISCUSSION

PKU Muhammadiyah Banjarnegara Hospital is a private hospital located on Jl. Raya Banjarnegara–Banyumas Km. 18, Danaraja Village, Purwanegara District, Banjarnegara Regency, Central Java. The hospital originated from a medical clinic established in 2008 as an expansion of a clinic in Merden Village. Due to limited human resources to manage two

healthcare units, the Danaraja Medical Center was closed in April 2014. Subsequently, the management, together with the Regional Health Council (MPKU), evaluated and planned for future development. In 2016, MPKU formed a development team led by Dr. Wahyu Priyatno, Sp.B, and collaborated with CV. Koedi Cilacap as the planning consultant. After going through the planning and funding process, construction began in February 2018 and was completed in February 2019.

PKU Muhammadiyah Banjarnegara Hospital was officially inaugurated on April 21, 2019, by Dr. H. Haedar Nashir, M.Si, Chairman of Muhammadiyah Central Board, and began operations on May 20, 2019, under the leadership of Dr. Bugar Wijiseno. The hospital’s vision is to become an Islamic, humanistic, and progressive hospital, with missions to implement Sharia-based health services, become a maternal and neonatal referral center, develop excellent human resources, and optimize information technology in healthcare services. With the motto “Professional and Islamic,” the hospital is committed to being a trauma center that cares for mothers and children, remains disaster-ready, and provides promotive, preventive, curative, and rehabilitative healthcare services based on Islamic values and quality standards.

Based on the data obtained, there were significant differences in employee incentives and office supplies expenditures before and after the implementation of the Electronic Medical Record (EMR) system at PKU Muhammadiyah Banjarnegara Hospital. The following tables present a detailed comparison of these changes and their implications for cost efficiency and performance improvement.

As shown in Table 2, there was a notable change in employee incentives and office supplies expenditure after the implementation of the Electronic Medical Record (EMR) system. Employee incentives increased, reflecting improved recognition of staff efforts and adaptation to digital workflows. Conversely, the significant decline in office supplies expenses indicates enhanced cost efficiency due to reduced reliance on paper-based administrative processes.

Table 2.
Employee incentive data and office supplies expenditure before and after the implementation of the Electronic Medical Record (EMR) system

Month	Employee Incentives (Before EMR)	Employee Incentives (After EMR)	Office Supplies Expenditure (Before EMR)	Office Supplies Expenditure (After EMR)
January	4,184,363	8,413,198	2,118,000	4,354,000
February	4,026,835	9,142,140	15,574,727	3,053,000
March	3,798,834	8,297,773	6,023,727	5,074,000
April	3,667,461	7,779,731	5,404,227	2,141,000
May	5,176,880	7,586,345	9,187,727	5,080,200
June	5,711,256	8,314,221	8,433,727	6,022,500
July	5,661,122	7,235,183	9,334,227	1,022,000
August	6,896,863	7,488,422	6,990,227	2,915,000
September	7,066,928	7,975,963	10,081,227	4,393,000
October	7,994,541	8,180,398	9,580,227	1,697,500
November	9,715,292	8,160,869	9,442,227	3,688,500
December	6,844,148	6,875,430	14,434,300	1,209,000

Table 3 demonstrates that the hospital's work system transformed from manual, paper-based operations to a digital, integrated system. This transition not only accelerated work processes but also increased the number of employees eligible for incentives, suggesting improved performance and workload distribution. Efficiency and operational speed were significantly higher after EMR adoption.

Table 3.
Comparison of Incentives Before and After the Implementation of the Electronic Medical Record (EMR) System

Aspect	Before Electronic Medical Record (2022)	After Electronic Medical Record (2024)
Work system	Manual (paper-based and physical filing)	Digital (integrated and electronic)
Incentive range	Rp 3,667,461 – Rp 9,715,292	Rp 6,875,430 – Rp 9,142,140
Number of recipients	7 – 10 persons	10 – 11 persons
Incentive peak	November (Rp 9,715,292)	February (Rp 9,142,140)
Work pattern	Slow, dense, and manual	Fast, practical, and digital
Efficiency and speed	Low	High

Table 4
Comparison of Office Supplies (Stationery) Expenditures Before and After the Implementation of the Electronic Medical Record (EMR) System

Aspect	2022 (Before EMR)	2024 (After EMR)
Total office supplies expenditure	Rp 106,604,570	Rp 40,649,700
Monthly expenditure range	Rp 2 million – Rp 15.5 million	Rp 1 million – Rp 6 million
Highest expenditure months	February and December	June
Frequency of form usage	Very frequent	Very rare
Use of paper and folders	High	Minimal
Main expenditure source	Archiving, manual documentation	Printed reports and physical backups
Budget efficiency	Low	High

Table 4 highlights the financial impact of EMR implementation, with total office supplies expenditure decreasing from Rp 106,604,570 in 2022 to Rp 40,649,700 in 2024—a reduction of approximately 61.9%. The frequency of form usage and paper consumption dropped dramatically, confirming that the EMR system effectively minimized manual documentation needs. Overall, the implementation of EMR at PKU Muhammadiyah Banjarnegara Hospital resulted in measurable improvements in efficiency, resource management, and cost savings.

These results are not consistent with the findings of the study conducted by Fanny Nur Septiana (Nur Septiana Fanny, 2023) which showed that the implementation of the Electronic Medical Record (EMR) system contributed to a 26.49% reduction in employee wage costs. This decrease occurred because the work of medical record practitioners became predominantly computerized through the web-based EMR system, thereby reducing manual workload and paper usage, which ultimately lowered expenditures in the medical record unit.

The study conducted at PKU Muhammadiyah Banjarnegara Hospital revealed that before the implementation of the Electronic Medical Record (EMR) system in 2022, the work process in the medical record unit was still manual, involving paper-based patient data recording, document filing, and administrative reporting. This manual system caused a high physical and administrative workload, which contributed to a gradual increase in employee incentives. After the implementation of the EMR system in 2024, the unit experienced a digital transformation that streamlined workflow, reduced manual tasks, and improved service efficiency (Sari, 2023).

Although incentive amounts fluctuated, the process became more structured and effective due to an integrated system and better workload distribution among employees.

The financial analysis of office supplies expenditure showed a significant decrease after the EMR implementation. Before digitalization, the hospital spent Rp 106,604,570 in 2022 on paper, folders, printer ink, and forms, with the highest expenses in February and December. In 2024, the cost dropped sharply to Rp 40,649,700, with the peak spending occurring only in June due to audit and mid-year reporting needs. This demonstrates that digital documentation has drastically reduced the use of stationery and physical forms, improving budget efficiency.

This decrease in expenditure is also consistent with the findings of a study conducted by Nur Septiana Fanny (Nur Septiana Fanny, 2023) which stated that the digitalization of medical records has had a significant impact on reducing the demand for office supplies (stationery), especially forms that are now available in digital format within the Electronic Medical Record (EMR) system. In addition, the need for overtime has decreased because most tasks can now be completed more quickly and in a more structured manner using computers, including the scanning of paper documents to be uploaded into the EMR system (Arsyam et al., 2024; Puspita et al., 2024).

The implementation of the EMR system provided multiple benefits for the hospital. One major advantage was the reduction in paper use, as medical data were recorded electronically, decreasing the need for printed documents and supporting an environmentally friendly initiative. Additionally, EMR reduced the risk of losing physical records, since all patient data were securely stored in a digital database with backup systems, ensuring better accuracy and accessibility of medical information (Amin et al., 2021; Ayu & Lazuardi, 2023).

EMR implementation also improved workflow efficiency by speeding up data input and retrieval processes. Previously, staff had to manually search for physical records, which was time-consuming. With the digital system, medical personnel could instantly access patient data, facilitating faster and more coordinated services. Furthermore, it optimized physical space utilization—rooms previously used for document storage could now be repurposed for more productive hospital activities (Prisusanti et al., 2024; Simbolon et al., 2023).

Lastly, EMR implementation contributed to faster BPJS (national health insurance) claim processing. Digitally stored records allowed for direct access and submission without manual document handling, expediting verification and approval. Although the reduction in overall hospital operational costs was only about 10%, due to other fixed expenses such as staff salaries and equipment maintenance, the EMR system has significantly improved efficiency, accuracy, and service quality (Andika et al., 2025). Overall, the transition from manual to electronic systems represents an essential step toward modern, cost-effective, and high-quality hospital management.

CONCLUSION

The implementation of the Electronic Medical Record (EMR) system at PKU Muhammadiyah Banjarnegara Hospital has significantly improved efficiency, service quality, and cost management. Following the adoption of EMR in 2024, employee incentives became more stable and evenly distributed, indicating improved productivity and reduced manual workload. Operational expenses for office supplies also decreased markedly from Rp 106,604,572 in 2022 to Rp 40,649,700 in 2024, demonstrating substantial cost savings resulting from the reduction in paper-based administrative processes. In addition, the use of EMR minimizes the risk of lost or misfiled records, accelerates access to patient information, improves the accuracy of BPJS claims, and reduces the need for physical document storage. Overall, EMR

implementation has enhanced data accuracy, streamlined hospital operations, and supported the digital transformation of health information management.

To sustain these improvements, the hospital needs to routinely maintain and update the EMR system to ensure performance stability and data security. Continuous staff capacity-building is essential to optimize system utilization and maintain data accuracy. The hospital should also conduct regular evaluations to identify and address technical or administrative issues that may arise. Furthermore, EMR-generated data should be integrated into managerial decision-making processes, and digitalization efforts should be expanded to other units to strengthen data interoperability and service quality.

For future research, further studies are recommended to: (1) calculate the Return on Investment (ROI) of EMR implementation to quantitatively measure long-term financial gains; (2) conduct a comprehensive cost-effectiveness analysis to compare EMR-related expenditures with operational and clinical benefits; and (3) explore broader system integration, particularly the interoperability between EMR and SIMRS, to assess its impact on workflow optimization and hospital-wide data management.

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