

Review of the Implementation of E-Puskesmas Using the PIECES Method in Improving the Quality Efficiency of Registration at Betoambari Health Center

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A B S T R A C T

*The advancement of information technology in the health sector plays a vital role in improving the quality of services, particularly in primary health care facilities such as community health centers. One of the key innovations is the implementation of **Electronic Medical Records (EMR)**. This study aims to evaluate the adoption of the **e-puskesmas** system using the **PIECES framework** to assess its impact on the efficiency of patient registration at Betoambari Community Health Center in 2025. A qualitative method with a phenomenological approach was employed, and data were collected through interviews, direct observation, and document review, supported by interview guides, observation sheets, and documentation checklists. The findings reveal that EMR provides positive contributions across all dimensions of the analysis. In terms of **Performance**, the system reduces manual workload, accelerates data entry, and minimizes recording errors. Regarding **Information**, EMR offers complete, structured, and secure patient data aligned with user authority levels. From an **Economic** perspective, operational costs are reduced without compromising service quality. On the **Control** aspect, EMR ensures data security through effective access management, with no violations reported. Concerning **Efficiency**, the system enhances staff productivity by streamlining processes and reducing technical disruptions. Finally, in the **Service** dimension, EMR improves patient satisfaction by accelerating service delivery, simplifying data access, and strengthening communication. In conclusion, the application of EMR at Betoambari Health Center has proven effective in enhancing efficiency, safeguarding data, reducing costs, and improving service quality.*

INTRODUCTION

The healthcare sector in Indonesia is currently in a significant phase of digital transformation. One form of real implementation of this process is the use of **Electronic Medical Records (RME)**. The existence of RME has obtained a strong legal basis through the Regulation of the Minister of Health of the Republic of Indonesia Number 24 of 2022. The regulation mandates all health service facilities to integrate the implementation of RME through **the One Sehat** application developed by the Ministry of Health. Puskesmas, as the spearhead of first-level health services, is included in the category of facilities that are required to implement this system, with the main goal of improving service quality and efficiency in providing services to the community (Permenkes RI No. 24, 2022) and (Himastuti et al., 2023).

By definition, a medical record is a legal document that contains the patient's identity, examination history, medical procedures, treatment, and various forms of health services that have been provided. Through digitization, electronic medical records are here to replace paper-based systems by utilizing information technology as a means of support (Permenkes RI No. 24, 2022). According to Elishabeth and Endang (2015) in (Maulidah, 2019), the quality of health services represents the level of service perfection in accordance with professional standards, ethical principles, legal rules, and socio-cultural norms, although in its implementation it still has to pay attention to limited resources. This is reinforced by Noviana (2011) in (Maulidah, 2019) who emphasizes that the quality of service is closely related to the level of patient satisfaction as the main beneficiary.

The development of information technology globally has also encouraged modernization in the health sector. One of the tangible forms of modernization is the use of health information systems that include electronic medical records. The implementation of this system has been proven to contribute to improving work efficiency, improving the quality of documentation, and accelerating the health service administration process (Rusmana & Sari, 2023). This becomes relevant considering There are various

weaknesses in the manual system, such as delays in document processing, obstacles in prescription services, and limited access to patient data at the same time. With digitalization, the storage and tracking of patient data can be done more quickly, thereby supporting responsive, transparent, and efficient health services (Muhammad Nafis, Dwidya Poernareksa, M. Dedy Rosyadi, 2023).

Conceptually, RME can be understood as the use of information technology to collect, store, process, and provide access to patient data. Handiwidjojo (2015) emphasized that the presence of RME provides great benefits for medical personnel in documenting, monitoring, and managing patient health services in a more structured manner. In line with that, previous studies have shown that the implementation of RME plays a role in improving service quality, strengthening documentation accuracy, increasing patient satisfaction, and reducing the risk of clinical errors ((Purwaningsih & Johan, 2024); (Larasugiharti, 2023)). Thus, RME is seen as the right strategy in building a more modern, effective, and patient-oriented health service system.

A number of empirical studies have also strengthened the effectiveness of the implementation of RME in the field. (Ariani, 2023) found that RME was able to increase the productivity of medical record units, encourage collaboration across health professionals, reduce patient waiting times, and ensure service continuity. (Saputro, 2018) also reported that complaints related to file delays can be significantly minimized through the implementation of RME, so that the flow of services becomes more efficient. Meanwhile, a study (Muliandari Gusni, 2024) revealed that the E-Medrec and SIMRS systems have been proven to provide direct benefits in the patient registration process, by improving the quality of services as well as the effectiveness of the performance of administrative personnel.

The results of the initial study conducted at the Betoambari Health Center show that since February 2024, an e-puskesmas-based RME system has been implemented as part of the digital transformation agenda for health services. However, the implementation has not been fully optimal because there are still obstacles, such as limited computer devices, unstable internet network quality, and problems in data synchronization. These barriers have the potential to reduce service efficiency, especially at the stage of patient registration that requires data speed and accuracy. Therefore, further research using the PIECES method is needed to evaluate the extent to which the e-puskesmas system contributes to improving the quality and effectiveness of patient registration at the Betoambari Health Center by 2025.

METHOD

This study applies a qualitative approach with a phenomenological design to describe the application of Electronic Medical Records (RME) in improving the quality of registration services at the Betoambari Health Center. The main informants consist of a medical record officer and a registration officer, with the head of the medical record unit acting as a triangulation of sources. The focus of the study was directed at the evaluation of the e-Puskesmas system using the PIECES (Performance, Information, Economy, Control, Efficiency, Service) framework to assess the success of implementation. Data were obtained through observation methods, in-depth interviews, and documentation review, with instruments in the form of observation sheets, interview guides, stationery, and voice recorders. The validity of the data is guaranteed through triangulation of sources and techniques, while analysis is carried out through a systematic process of reduction, presentation, and conclusion drawn.

RESULTS & DISCUSSION

Implementation of E-Puskesmas in Improving the Efficiency of Registration Quality Based on Performance Criteria.

Research carried out at the Betoambari Health Center shows that the use of the E-Puskesmas system has a positive impact on the performance aspect. The implementation of Electronic Medical Records (RME) has been proven to reduce the manual workload of health workers, where previously officers had to handle recording 10-20 patient data per day, now only about 2-5 data because the input process has been automatically integrated. This change not only streamlines work time, but also reduces the possibility of recording errors that are often found in manual systems. In addition, the administrative staff said that the data classification process and the preparation of daily and monthly reports became faster, more consistent, and more accurate thanks to the support of automation features in the system. Thus, the use of E-Puskesmas can be seen as a strategic factor in increasing employee productivity,

accelerating administrative services, and strengthening the quality of patient registration services at the Betoambari Health Center.

In the perspective of the PIECES theory introduced by (Whitten et al., 2004), the performance aspect refers to the ability of the information system to run processes effectively, both in terms of speed, workload handling capacity, and resource utilization efficiency. In the realm of health services, optimizing this aspect is very important, because information systems are expected to be able to speed up the flow of patient administration, reduce the risk of recording errors, and produce valid data to support decision-making at both the clinical and managerial levels. Thus, the implementation of E-Puskesmas is basically not just the digitization of records, but a strategic effort to increase the effectiveness of health services as a whole.

The results of this study are also in line with previous studies. (Prasetya, 2024) emphasized that the implementation of hospital information systems has a real impact in the form of accelerating access to patient data, ease of preparing reports, and improving workflow efficiency which directly contributes to improving employee performance and reducing the rate of human error. Meanwhile, (Windarti, 2023) highlighted that digitalization is able to increase work time efficiency by up to 40% and significantly improve the accuracy of daily and monthly reporting. The two studies show consistency that the application of digital-based information technology has a positive influence on the effectiveness and operational efficiency of health institutions.

Field findings at the Betoambari Health Center show consistency with the PIECES theory and previous empirical evidence. The use of E-Puskesmas not only reduces the manual workload of health workers, but also accelerates access and provision of administrative data, improves recording accuracy, and makes it easier to prepare reports more quickly and accurately. In other words, the implementation of RME makes a direct contribution to strengthening the work efficiency of officers and supporting the improvement of the quality of patient registration services at the facility.

Overall, the results of this study show that digitalization through E-Puskesmas is an effective strategy to optimize the performance of information systems in primary health services. The success in performance aspects at the Betoambari Health Center confirms that an electronic-based information system is now a need that cannot be postponed, considering its significant role in realizing more efficient, accurate, and quality-oriented health services. Thus, the implementation of E-Puskesmas can be used as a model in efforts to strengthen digital transformation in the health sector in various regions

Implementation of E-Puskesmas in Improving the Efficiency of Registration Quality Based on Information Criteria.

Research conducted at the Betoambari Health Center shows that the implementation of E-Puskesmas in the *information* aspect has been carried out effectively. Through the use of Electronic Medical Records (RME), this system is able to present comprehensive data, ranging from patient identities, medical history, to medical procedures given. The provision of this information is adjusted to the access rights of each officer, so that patient safety and privacy are protected. All stored data is used in every stage of service, from registration, examination process, to medical treatment. This makes the service process more on target, faster, and runs efficiently compared to the previous manual system.

According to the PIECES framework proposed by (Whitten et al., 2004), the information *aspect* emphasizes the importance of the availability of accurate, relevant, timely, and reliable information. A quality information system is required not only to be able to meet the needs of users in providing complete data, but also to be easily accessible and still ensure security through access restrictions according to roles. In the context of health services, this is crucial because the quality of information will affect the speed of service, the accuracy of diagnosis, and the accuracy of medical measures given to patients.

The results of this study show compatibility with previous findings. (Prasetya, 2024) emphasized that completeness of information is an important factor in supporting the sustainability of health services, especially in recording patients' medical histories which must be regulated based on the authorization of officers. Meanwhile, research (Zahrah & Rahmawati, 2024) reveals that an integrated health information system makes it easier for medical personnel to obtain patient data quickly and accurately. Real-time information has been proven to speed up service flows and reduce the risk of miscommunication among health workers, which has often been an obstacle in manual systems.

The findings at the Betoambari Health Center strengthen the PIECES theory and previous research. The RME at the E-Puskesmas not only provides complete patient information, but also maintains security through a system of restricting access rights. In addition, the availability of information that can be accessed in real-time by authorized officers supports medical decision-making more effectively. The combination of data completeness, ease of access, and privacy security creates a more efficient service flow without sacrificing patient data protection.

Overall, the implementation of E-Puskesmas in the *information aspect* can be declared successful. This system has been proven to support the improvement of the quality of registration services at the Betoambari Health Center by providing complete, accurate, and safe information. These results reinforce the PIECES theory as well as previous research that an integrated, structured, and controlled health information system is an important component in supporting a more professional and sustainable improvement of the quality of health services.

Implementation of E-Puskesmas in Improving the Efficiency of Registration Quality Based on Economy Criteria.

Research carried out at the Betoambari Health Center shows that the implementation of E-Puskesmas in the economic aspect has a significant impact on operational cost savings. The use of Electronic Medical Records (RME) reduces dependence on physical needs such as stationery, folders, and archive shelves that were previously indispensable in manual recording systems. With this reduced need, the burden of operational costs of health centers can be significantly reduced. In addition, the workflow becomes faster and more efficient without compromising the quality of the services provided. In fact, the quality of service tends to improve because the administrative process is more organized, there are fewer recording errors, and it is easier to manage by officers.

Based on the PIECES framework proposed (Whitten et al., 2004), the economy aspect focuses on cost efficiency and optimization of resource use that can be achieved through the application of information systems. The ideal system is not only able to reduce expenses for physical means such as paper, stationery, and archive storage space, but also minimize labor and labor time usage. Thus, the effectiveness of information systems in economic aspects is not only measured in terms of cost savings, but also in terms of its ability to maintain the quality of services to the community.

These findings are consistent with previous research that emphasizes the importance of economic aspects in the process of digitizing health services. (Prasetya, 2024) reported that the implementation of electronic medical records at Wonosari Hospital has succeeded in reducing administrative costs, especially in the purchase of forms, paper, and stationery. Furthermore, digitalization also reduces the need for archive space and speeds up the service process by minimizing the involvement of administrative labor. Research (Zahrah & Rahmawati, 2024) also confirms that digital-based health information systems make a great contribution to the efficiency of the operational budget of health centers, by reducing the cost of printing, copying, and manual filing, while increasing the speed of patient service.

The findings at the Betoambari Health Center reinforce the PIECES theory and previous empirical evidence. The implementation of RME has been proven to be able to reduce operational costs by reducing the need for physical facilities, streamlining administrative processes, and creating more optimal workflows. The resulting efficiency does not reduce the quality of service, but rather supports quality improvement because the administrative process is faster, more structured, and less error-free. Thus, cost efficiency goes hand in hand with improving the quality of health services.

Overall, the implementation of E-Puskesmas in the economic aspect at the Betoambari Health Center has proven to be effective in creating cost efficiency while maintaining service quality. The implementation of RME not only results in operational budget savings, but also improves the quality of administrative and clinical services. These results confirm that the digitization of health information systems is the right and relevant strategy to realize economic efficiency in the implementation of health services, especially at the primary service level such as health centers.

Implementation of E-Puskesmas in Improving the Efficiency of Registration Quality Based on Control Criteria.

The results of the research on the control aspect show that the implementation of Electronic Medical Records (RME) at the Betoambari Health Center has been equipped with a strict access control mechanism. The right of access is only given to authorized officers in accordance with their respective roles and responsibilities, thereby minimizing the potential for misuse of information. In addition, all

activities carried out in the system are automatically recorded and documented, making it easier to monitor and supervise by internal managers. During the implementation period, there were no indications of security breaches or patient data leaks, indicating that the control system was running optimally. This not only ensures the protection of medical data, but also increases the level of trust of officers and the public in the system used.

In the PIECES framework proposed (Whitten et al., 2004), the control aspect is closely related to the ability of information systems to regulate user access and activities. This mechanism includes authority restrictions, activity recording (trail audits), and periodic supervision to ensure that data is properly protected. With clear controls, information systems can reduce the risk of security breaches, maintain data integrity, and ensure service reliability. In the context of healthcare, control is a crucial aspect because patient medical data is very sensitive and requires extra protection from potential leakage and misuse.

Previous research has also reinforced the importance of this aspect. (Prasetya, 2024) in his research at Wonosari Hospital found that the implementation of user account-based control and activity log recording can significantly reduce the risk of misuse of medical information. The same thing is also stated by (Zahrah & Rahmawati, 2024) who affirms the role of trail audits, restrictions on access rights, and routine supervision as important elements to ensure the security of patient data. The results of this study confirm that a strong control system is the main prerequisite for maintaining user trust in digital services in the health sector.

The findings at the Betoambari Health Center show consistency with the PIECES theory and previous empirical studies. The implementation of role-based access restriction mechanisms and monitoring of system activities has proven to be effective in protecting the confidentiality and integrity of patient data. This success not only has an impact on the information security aspect, but also contributes to the improvement of the efficiency of administrative services because each process runs within a controlled and accountable framework.

Thus, the control aspect in the implementation of the E-Puskesmas at the Betoambari Health Center can be said to have run optimally. The control system implemented not only ensures data security, but also supports the creation of a digital ecosystem that is reliable, efficient, and in accordance with information security standards in the health sector. This success shows that effective control is an important foundation for the sustainability of the digitalization of healthcare services.

Implementation of E-Puskesmas in Improving the Efficiency of Registration Quality Based on Efficiency Criteria.

The results of the study on the efficiency aspect show that the implementation of Electronic Medical Records (RME) at the Betoambari Health Center has a significant positive impact on the smooth workflow. The process of compiling reports becomes faster and more practical because patient data has been organized automatically in the system, so that officers no longer need to perform manual classification. The simple and easy-to-understand RME navigation design makes it easier for officers to operate the system, even without the need for intensive technical training. In addition, during periods of use, the system is relatively stable and rarely experiences technical glitches, which means that officer productivity is maintained. This condition shows that efficiency is one of the main benefits that health workers at the Betoambari Health Center feel most after the implementation of the E-Health Center.

According to the PIECES framework presented (Whitten et al., 2004), the efficiency of information systems is characterized by their ability to reduce the need for time, effort, and resources in producing outputs, without degrading quality. This means that an efficient system is able to simplify the work process while maintaining the quality of the information produced. In line with this, research (Prasetya, 2024) reveals that a structured health information system can reduce data redundancy, speed up information collection, and facilitate the systematic preparation of reports. (Yusuf & Novitasari, 2024) added that the level of efficiency can also be measured through the speed of data input, system stability, and the lack of technical obstacles that are directly related to the job satisfaction of health workers.

The findings at the Betoambari Health Center strengthen the theory and results of previous research. The implementation of RME has been proven to be able to simplify administrative flows, speed up the service process, and reduce manual workloads that were previously quite time-consuming. With a stable and easy-to-use system, the work efficiency of officers increases, especially in data management and patient report preparation. This shows that the system not only functions as a medium for digitizing records, but also as a strategic instrument in creating more optimal service governance.

Implementation of E-Puskesmas in Improving the Efficiency of Registration Quality Based on Service Criteria.

Research on the service aspect shows that the implementation of Electronic Medical Records (RME) at the Betoambari Health Center is able to provide a significant improvement in the quality of services to patients. The service time becomes shorter because the process of data input and patient information search can be done instantly through a digital system. In addition, communication between officers takes place more effectively, because data can be accessed simultaneously by several units, so that cross-section coordination in providing services becomes more integrated. This condition has a direct impact on increasing patient satisfaction, where the health services provided become more responsive, structured, and have a higher level of professionalism compared to the previous manual system.

According to (Lovelock & Wright, 2007), the quality of services in the health sector is determined by five important dimensions, namely reliability, responsiveness, assurance, empathy, and tangible evidence. The implementation of health information systems such as RME has the potential to strengthen these five dimensions, especially through easy access to patient data, acceleration of the administrative process, and consistency of the information presented. This is in line with the findings (Prasetya, 2024), which identify that the implementation of RME is able to accelerate service flows, increase the effectiveness of communication between officers, and provide real-time access to patient data. Research (Yusuf & Novitasari, 2024) also confirms that the digitization of RME-based services plays a role in accelerating services, reducing the potential for errors, and improving coordination between health service units.

The findings at the Betoambari Health Center are consistent with theories (Lovelock & Wright, 2007) as well as previous research. The RME system has been proven to speed up the service process, improve smooth communication between officers, and strengthen coordination across units in handling patients. This positive impact directly increases patient satisfaction because they experience faster, responsive, and quality service. Thus, the service aspect in the implementation of the E-Puskesmas at the Betoambari Health Center can be declared to have run optimally. This success not only reflects improvements on the administrative side, but also makes a real contribution to improving the quality of health services, especially in the process of registration and patient handling.

COVER

Based on the findings of research at the Betoambari Health Center, the implementation of the E-Puskesmas system through Electronic Medical Records (RME) has been proven to make a significant contribution to improving the efficiency as well as the quality of patient registration services. In general, the implementation of RME is able to simplify administrative workflows, speed up service processes, and maintain the security of patient data, thereby supporting the realization of more effective, accurate, and quality-oriented health services. When viewed from the perspective of PIECES theory, the RME system has a positive impact on all dimensions. In terms of *performance*, RME reduces the manual workload of officers and reduces the potential for recording errors. In terms of *information*, the system is able to provide complete, structured, real-time, and secure patient data through restrictions on access rights. Furthermore, from an *economic perspective*, digitalization through RME has been proven to reduce operational costs by reducing the use of physical facilities such as paper, maps, and archive space. From the control aspect, the implementation of authority-based access restrictions and recording of system activities ensures data security and increases user trust. The *efficiency* aspect also shows positive results through accelerated reporting, system stability, and ease of use without the need for intensive training. Finally, in the *service aspect*, service quality has improved thanks to the acceleration of service time, the effectiveness of communication between officers, better coordination across units, and increased patient satisfaction.

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