Unlocking Electronic Medical Record Success: Readiness Assessment with the DOQ-IT Method

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Abstract. The Regional General Hospital Genteng Banyuwangi continued to use paper-based medical records, resulting in a 44.33% delay in the return of inpatient medical records during the fourth quarter of 2023. This study aims to assess the hospital's readiness to implement Electronic Medical Record (EMR) using the Doctor's Office Quality Information Technology (DOQ-IT) method. A total of 40 respondents participated in this study at RSUD Genteng Banyuwangi, which used the DOQ-IT method to measure readiness for EMR implementation. The assessment found that the hospital's information technology infrastructure, leadership and governance, and human resources were all ready for implementation. However, the organizational work culture was not yet ready. Overall, the readiness level for implementing electronic medical records is at Level II, indicating that the hospital is ready for EMR implementation. The lack of Standard Operating Procedures (SOPs), limited computer skills, insufficient computer availability, and inadequate vendor and hospital training were identified as obstacles to EMR adoption. It was therefore essential to create SOPs, expand computer availability, and conduct regular training sessions to overcome these issues.

1 Introduction

A hospital is a health service institution that provides comprehensive individual health services, provides inpatient, outpatient, and emergency services, and is required to maintain medical records [1]. Medical records are documents containing information about a patient's identity, medical examinations, treatments, actions, and other services provided [2]. All primary and advanced health care facilities, as well as independent medical practices such as dentists or doctors, must maintain complete and consistent written medical records. The process of creating medical records involves recording the results of tests, procedures, activities, and other services provided to patients. In today's fast-paced era, information and communication technology (ICT) is also advancing quickly across various fields, including health, particularly in the development of Electronic Medical Records (EMR). The Minister of Health of the Republic of Indonesia issued regulations on EMR No. 24 of 2022 in response to ICT development, mandating that all healthcare facilities in Indonesia implement EMRs by December 31, 2023 [3].

Medical records created through an electronic system designed for medical record organization are known as electronic medical records, which help patients receive high-

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quality healthcare by enabling effective data management [2]. At Genteng Banyuwangi Regional Hospital, medical records are still managed manually, which presents challenges. The delay in returning inpatient and outpatient medical records is one of the issues that arises. In the fourth quarter of 2023, the highest delay occurred in returning patient medical records (44.33%). The large number of medical record delays leads to a backlog in data processing and medical record reporting.

Electronic medical records (EMR) can be used to solve issues that arise in manually operated medical records systems. To implement EMR, Genteng Banyuwangi Regional Hospital needs to prepare users and prepare its electronic system. Assessing readiness is crucial for effective implementation [3]. One technique for assessing readiness, DOQ-IT method, can be used to determine the degree of readiness for EMR deployment. DOQ-IT (Doctor's Office Quality-Information Technology) is a method for measuring readiness in adopting a new system. Moreover, the level of user readiness to implement the system can be assessed based on the preparedness of human resources (brainware), infrastructure, and facilities. However, staff members are not yet fully trained in using electronic medical records, and there are currently no documented Standard Operating Procedures for its application. Therefore, it is necessary to measure the level of readiness for EMR implementation. This study aims to determine the hospital's readiness to implement EMR in terms of human resources, organizational work culture, leadership governance, and IT infrastructure.

2 Methods

2.1 Research Design

This study used a quantitative descriptive design with a cross-sectional approach to assess hospital readiness for implementing Electronic Medical Records based on the DOQ-IT framework, covering human resources, organizational culture, leadership governance, and infrastructure.

2.2 Location and Time of Research

This research was conducted at Genteng Banyuwangi Regional Hospital, located at Jalan Sultan Hasanuddin No. 98, Genteng Wetan, Banyuwangi, East Java, Indonesia, from February 2023 to May 2024.

2.3 Population, Sample, and Sampling Method

The study population included hospital staff from 44 units involved in EMR implementation and management at Genteng Banyuwangi Regional Hospital. Each unit was represented by one staff member, as only one username per unit was allowed for EMR access. The sample size was determined using Slovin's formula.

Simple random sampling was employed, giving all population members an equal chance to participate. A spinner randomizer selected 40 units out of 44 as the sample. Respondents included doctors, nurses, medical records officers, nutritionists, and laboratory, radiology, and physiotherapy staff. Questionnaires were completed by unit representatives in consultation with their colleagues.

2.4 Data Collection and Analysis

The data collection instrument in this study was a questionnaire, consisting of questions related to variables based on the DOQ-IT method, namely Human Resources, Organizational

Work Culture, Leadership Governance, and IT Infrastructure. The questionnaire included 21 questions to assess human resources, 16 to assess organizational work culture, 16 to assess Leadership Governance, and 12 to assess IT Infrastructure. The measurement utilized a positive four-point Likert scale, with positive statements scored as 4 (strongly agree), 3 (agree), 2 (disagree), 1 (strongly disagree), while negative statements were scored in reverse: 1 (strongly agree), 2 (agree), 3 (disagree), 4 (strongly disagree). The forms of data presentation used in this research include table, textual, and readiness matrix. The readiness matrix was presented in the form of a radar chart to facilitate information delivery through data visualization. The interpretation of Electronic Medical Records (EMR) implementation readiness scores was as follows: 1) Score 180 – 268: the hospital is fully prepared for EMR implementation; 2) Score 91 – 179: the hospital is ready for EMR implementation; and 3) Score 0 – 90: the hospital is not ready to implement EMR. This research was conducted after obtaining permission from the hospital and prior ethical approval to prevent future issues. This research ethics review was conducted at Jember State Polytechnic under certificate number 326/PL17.4/PG/2024.

3. Results and Discussion

3.1 Human Resources Readiness

The implementation of Electronic Medical Records can be successful if human resources is experienced and knowledgeable about EMR. The readiness of the human resources in education aspect is categorized as ready, with a readiness score of 72.5% (29 of 40 units), indicating that most of the staff members are highly educated. Moreover, the readiness score for the training aspect is also in the ready category, with a score of 82.5% (33 of 40 units). Although the training readiness rate is high, EMR implementation training is still rarely conducted, either by vendors or hospital information technology staff. Moreover, the importance of tailored and continuous training to accommodate diverse digital competencies aligns with earlier findings that staff preparedness is crucial in EMR adoption [4].

Additionally, the readiness score for knowledge in implementing EMR did not reach the maximum, reaching only 80% (32 of 40 units). Staff members as EMR users already have knowledge about EMR and understand how to maintain the confidentiality of electronic medical records; however, several units have limited understanding, including the Heart Polyclinic, Palliative Polyclinic, Second Class Surgical Room, Pain Polyclinic, Isolation Room, and Perinatology Room. Fifty-five percent of respondents stated that they were ready to implement EMR, while a relatively high proportion, 45% (18 of 40 units) were not ready. This was due to staff members' low computer operating skills. Longhini's findings stated that IT proficiency is a key requirement for the effective implementation of health information systems such as EMRs. Additionally, a shortage of personnel with IT expertise remains a major obstacle [5]. EMR-related socialization and training are essential to improve staff readiness in addressing this implementation challenge [6]. Therefore, it is important to enhance understanding of potential challenges in implementing electronic medical records (EMR) and strategies to address them effectively. Consistent application of EMR experience is essential, and core competencies should be clearly defined and upheld as a standard of professionalism [7-9].

3.2 Organizational Work Culture Readiness

Organizational work culture refers to the perspective and assessment of how healthcare workers or system users accept EMR. Electronic medical records can be implemented effectively if healthcare workers or users have adequate understanding and commitment to performing their work as planned. Aspects used to assess readiness in implementing EMR related to Organizational Work Culture include culture, standard operating procedures, and medical staff involvement. A total of 67.5% of respondents (27 of 40 units) were ready in terms of the culture of implementing electronic medical records. Officers understand that using EMR facilitates their work and management decision-making. Cultural readiness reflects officers' responsiveness in accepting information technology to support their work [10].

In addition, most respondents' readiness in terms of standard operating procedures was at the unprepared level; only two units were ready to implement EMR in this aspect, namely Internal Medicine Room 2 of Third Class and Neurology Polyclinic. Genteng Banyuwangi Regional General Hospital currently relies solely on a director's decree requiring the use of EMR, as no specific SOPs for electronic medical records have been established. The results align with earlier research by Trisbudianingsih, which found that the hospital has not yet developed formal work procedures or standard operating procedures (SOPs) for the implementation of electronic medical records (EMRs). The current progress of EMR implementation currently relies on existing workflow processes, which remain inadequate due to the lack of updated guidelines for transitioning from conventional paper-based records to electronic systems. Consequently, it is essential to establish SOPs that clearly outline the EMR workflow, enabling users to understand and follow the implementation process effectively [11].

The involvement of medical personnel in the electronic medical record design process reached 50%, while the remaining 50% were not involved. Health workers should participate in the design of EMR to convey the needs regarding variables for reporting and recording health status in the system. Such involvement ensures that the EMR accommodates their work requirements and enhances user acceptance of the system [10].

3.3 Leadership Governance Readiness

Leadership refers to an individual's ability to influence others to achieve organizational goals. The success or failure of an organization depends heavily on how leaders implement policies. Based on the leadership aspect, 80% of respondents (32 of 40 units) were categorized as ready. Respondents stated that the leadership provided full support in the EMR implementation, as encouragement and motivation from leaders increased staff confidence in using EMR. Moreover, the strategy aspect showed that 85% of respondents were categorized as ready. Although the strategic readiness for EMR implementation was high, several units reported insufficient readiness, including the Perinatology Room, Second- and Third-Class Children's Rooms, Payment Unit, Cardiac Polyclinic, and First Class Room. The results align with a previous study emphasizing the importance of a socio-technical approach in implementing health information systems, highlighting that the social aspects of technological change have been largely overlooked. Therefore, the hospital should strengthen its governance and leadership to ensure the successful implementation of EMR by developing a clear strategy, enhancing coordination between units, and adopting a comprehensive approach to managing both organizational and technological changes [12].

The other aspect of leadership is IT management support, which involves appointing an EMR manager to resolve issues regarding information technology. The results showed that 90% of respondents (36 of 40 units) stated that IT management support was ready. This aligns

with the hospital's current condition, where the management of electronic medical records has been assigned to the hospital's Information Technology officers in collaboration with the vendor. The officers appointed as administrators are experienced members of the hospital's information technology team who received training on designing and managing electronic medical records. Following this, the accountability aspect showed that 80% respondents (32 of 40 units) were included in the ready category. Accountability refers to the readiness of officers or teams appointed by the hospital director to analyze selected products, vendors contracts, provisions, and negotiations related to EMR implementation. Therefore, the responsibility for EMR planning must be further strengthened to ensure that the resulting system is optimal and aligned with hospital needs.

3.4 Information Technology Infrastructure Readiness

Information Technology (IT) infrastructure refers to the tools and systems that support the implementation of Electronic Medical Records (EMR). To assess the readiness of IT infrastructure for EMR implementation, researchers considered several aspects, including facilities, infrastructure, and budget. Facilities refer to the hardware and software necessary to support EMR operations. The results showed that 40% of respondents (16 out of 40 units) reported that the facilities for EMR implementation were not yet ready, mainly because not all hospital areas were equipped with computers to support EMR use. Therefore, it is necessary to increase the availability of these facilities to enable simultaneous and comprehensive electronic medical records implementation. Brommeyer emphasized the importance of a systematic approach in developing health technology infrastructure [13]. A well-developed infrastructure, encompassing hardware, software, and technical support, is essential for the effective adoption of health technology and for enhancing organizational efficiency and effectiveness [14].

In this study, infrastructure refers to the supporting facilities needed for implementing electronic medical records (EMR), such as buildings, structures, or designated rooms. At Genteng Banyuwangi Regional Hospital, infrastructure readiness for EMR implementation was classified as 'ready', with a score of 85%. The IT staff have designated workspaces, and a dedicated room houses network and server equipment, where security is a priority. The budget, which supports EMR planning and implementation, is considered 'ready' by 80% of respondents. Although budget monitoring and optimization are in place, financial constraints have resulted in the phased development of the EMR system due to high costs. Strong financial support from management can positively impact the future development of EMR [15].

3.5 Readiness Analysis for Implementing Electronic Medical Records at Genteng Banyuwangi Regional Hospital

The following table shows the average readiness assessment results for the implementation of electronic medical records across each variable.

Table 1. Readiness Score for EMR Implementation at Genteng Banyuwangi Regional Hospital

No.	Variable	Score	Total of Questions	Means
1.	Human Resources	54,1	19	2,81
2.	Organizational Work Culture	41,12	16	2,47
3.	Leadership Governance	47,34	20	3,13

4.	Information Technology Infrastructure	35,15	12	3,01
Total		178,71	67	2,85

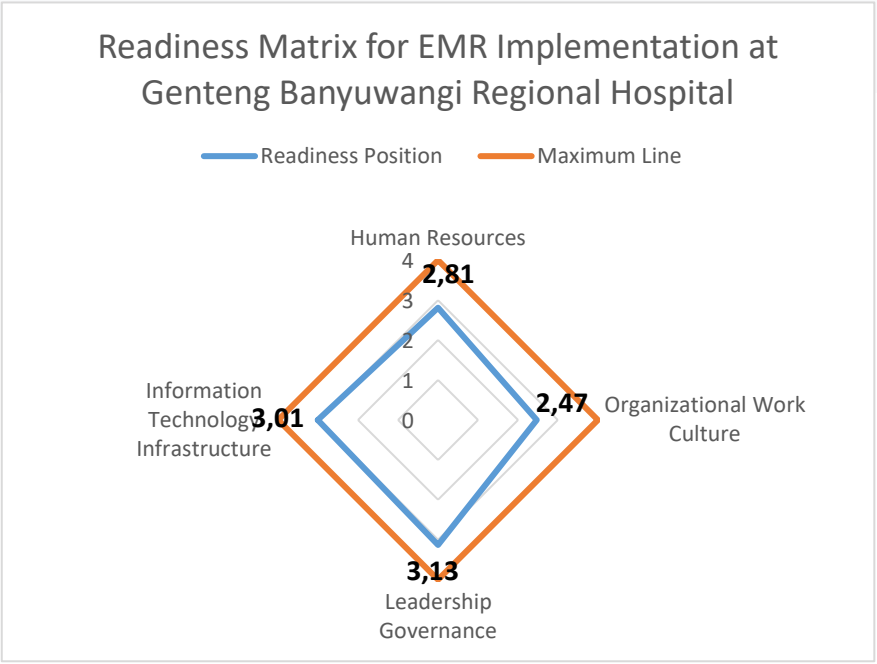

Fig. 1. Readiness Matrix for EMR Implementation at Genteng Banyuwangi Regional Hospital

The table and matrix above show the average readiness scores for each variable. The overall average indicates that Genteng Banyuwangi Regional Hospital is ready to implement electronic medical records. With an average score of 2.85, which is close to 3, the hospital can be considered ready, although shortcomings remain. A higher readiness score for implementing electronic medical records reflect a higher level of preparedness [10]. Among the four variables, leadership governance achieved the highest with a value of 3.13. Based on this result, it can be concluded that leadership support is a key factor in the successful implementation of the program. Leadership support significantly influences the success of EMR implementation. This is evidenced by a policy issued by the hospital director regarding the implementation of EMR at Genteng Banyuwangi Regional Hospital. Leadership policies greatly impact the success of EMR adoption, as they motivate staff to comply and perform their duties effectively [15]. In addition to policies, staff morale can be further boosted through rewards from leadership for their performance achievements [10].

The readiness for implementing EMR based on the data above shows that the variable with the second-highest score is information technology infrastructure, with a value of 3.01. This high score is due to the appointment of IT personnel as EMR system managers and the availability of server or network rooms and dedicated spaces for IT staff. However, some units at Genteng Banyuwangi Regional Hospital still lack computers. During the design and development phase of EMR infrastructure, it is important to consider infrastructure development requirements to ensure data security, privacy, and data interoperability. Information systems require continuous development over time to meet evolving needs. To

maintain EMR data security, risk identification must be conducted before system development to anticipate potential issues that may arise afterward.

Next, based on the table above, the variable with the third-highest readiness score for the implementation of electronic medical records (EMR) is human resources, with an average score of 2.81. Human resources, as system users, play a crucial role in the implementation of EMR. An electronic system cannot function effectively if the users do not understand how to operate it. Staff or EMR users must have adequate computer skills and competencies, as these are essential to ensuring successful implementation of EMR. They also need to understand how to maintain data confidentiality and be aware of potential issues, as EMRs contain patients' complete treatment histories. Relevant training is essential to enhance their understanding and skills in using EMR. A lack of training has been identified as one of the barriers to successful EMR implementation. Such training aims to strengthen staff abilities and competencies in operating the electronic medical record system.

Meanwhile, readiness for implementing EMR in the Organizational Work Culture variable received the lowest score, with an average of 2.46. This low score reflects several shortcomings, primarily the absence of Standard Operating Procedures (SOPs) for the use and management of EMR. This finding contradicts the view of Sudirahayu and Harjoko [10], who stated that a good organizational work culture should be able to lead and establish policies, SOPs, and business processes related to user activities, as well as motivate staff to implement EMR. Moreover, the involvement of medical staff in the planning and development process is a key factor in the successful implementation of EMR. However, at Genteng Banyuwangi Regional Hospital, questionnaire results indicated that medical staff were not always involved in the system design process. In the early stages of EMR implementation, a shift in work culture is likely to occur, potentially causing both physical and psychological impacts due to the transition from manual record-keeping and handwritten documentation to electronic data entry using a computer [15].

Based on Table 4.15, the total score obtained from the readiness assessment for the implementation of electronic medical records (EMR) at Genteng Banyuwangi Regional Hospital is 178.71 out of a maximum score of 268. This places the hospital's readiness level in the second range, indicating that while there is strong capability in several assessment areas, some weaknesses still hinder full implementation. Therefore, further identification and anticipation of weaker components are necessary to ensure that EMR implementation can proceed smoothly. Although certain strengths support EMR adoption, several areas still show limitations that need to be addressed. Identifying strengths in each assessment area is crucial, as it helps determine which aspects should be prioritized by management and where additional planning is needed to support EMR implementation. The hospital also needs to communicate its ongoing processes and development plans to ensure a more structured and focused approach to adopting the electronic medical records system [15].

4. Conclusion

Based on assessments of Human Resources, Organizational Culture, Leadership Governance, and IT Infrastructure, Genteng Banyuwangi Regional Hospital is classified at Level II EMR readiness, with a total score of 178.71 out of 268. The hospital shows strength in leadership, infrastructure, and human resources but faces challenges related to work culture and supporting facilities. Further improvements are needed to ensure effective and sustainable EMR implementation. This study provides valuable insights for hospital leaders and policymakers by highlighting readiness levels, identifying key challenges, and offering practical recommendations to facilitate smoother adoption and enhance healthcare services quality.

References

[1] Ministry of Health of the Republic of Indonesia. *Regulation of the Minister of Health of the Republic of Indonesia Number 13 of 2022* (In Indonesian), (2022). https://peraturan.bpk.go.id/Download/212694/Permenkes%20Nomor%2013%20Tahun%202022.pdf

[2] Ministry of Health of the Republic of Indonesia. *Regulation of the Ministry of Health of the Republic of Indonesia Number 24 of 2022 about Medical Record*, (2022). https://keslan.kemkes.go.id/unduhan/fileunduhan_1662611251_882318.pdf

[3] Bahi, I. K., D. H. Putra, D. Sonia, and P. Fannya. Assessment of Readiness for Electronic Medical Record Implementation in the Inpatient Unit of Port Hospital, Jakarta, Indonesia. *Journal of Community Medicine and Public Health Research* **6,** 60–69, (2025).

[4] Budiantono and Widiyanto, W. W. Science Midwifery Readiness analysis of electronic medical record implementation in inpatient services using the DOQ-IT Method at Pusri Hospital Palembang. *Science Midwifery* **13**, 2721–9453, (2025).

[5] J. Longhini, G. Rossettini, and A. Palese. Digital Health Competencies Among Health Care Professionals: Systematic Review. *J Med Internet Res*. 24. 8, (2022).

[6] V. Debora Yolanda and M. Veranita. Analysis of The Readiness of Electronic Medical Record Implementation Using DOQ-IT at RSUD Class D Pratama Sendawar. *Digital Journal of Economic, Management and Social Sciences* **6**, 2 (2024). https://doi.org/10.38035/dijemss.v6i2

[7] Faida, E. W., Wiliyanarti, P. F., Magdalena, M. & Wahyuni, D. Readiness analysis of electronic medical record system (RME): A case study of secondary hospitals in Surabaya. *Health Technology Journal* **1,** (2023). https://doi.org/10.53713/htechj.v1i5.92

[8] Welcher, C. M., Hersh, W., Takesue, B., Stagg Elliott, V. & Hawkins, R. E. Barriers to medical students' electronic health record access can impede their preparedness for practice. *Acad. Med.* **93**, 48–53 (2018). https://doi.org/10.1097/ACM.0000000000001829

[9] Hung, H. et al. Assessing the quality of electronic medical records as a platform for resident education. *BMC Med. Educ.* **21**, 1 (2021). https://doi.org/10.1186/s12909-021-03011-0

[10] Sudirahayu, I. & Harjoko, A. Readiness analysis for the implementation of electronic medical records using DOQ-IT at Dr. H. Abdul Moeloek Regional General Hospital, Lampung. *J. Univ. Gadjah Mada* **1**, (2017).

[11] Trisbudianingsih, T., Yuniar, N. & Sudayasa, I. P. Analysis of factors influencing the readiness of implementing electronic medical records at Oputa Yi Koo Heart and Blood Vessel Hospital, Southeast Sulawesi Province. *World J. Adv. Res. Rev.* **25**, 615–624 (2025). https://doi.org/10.30574/wjarr.2025.25.3.0768.

[12] Thomas, A. Digitally transforming the organization through knowledge management: A socio-technical system (STS) perspective. *Eur. J. Innov. Manag.* **27**, 437–460 (2024). https://doi.org/10.1108/EJIM-02-2024-0114.

[13] Brommeyer, M. & Liang, Z. A systematic approach in developing management workforce readiness for digital health transformation in healthcare. *Int. J. Environ. Res. Public Health* **19**, 13843 (2022). https://doi.org/10.3390/ijerph192113843

[14] Damayanti, N. A. et al. Integrated information system for early detection of maternal risk factors based on continuum of care approach of mother and toddler cohorts. *Healthc. Inform. Res.* **25**, 153–160 (2019). https://doi.org/10.4258/hir.2019.25.3.153

[15] Praptana, K. P. N., Santoso, S. & Sevtiyani, I. Assistance in assessing the readiness for electronic medical record implementation using the DOQ-IT method at Condong Catur Hospital, Sleman. *J. Innov. Community Empowerment (JICE)* **3**, 98–104 (2021).