

Outpatient Electronic Medical Record Adoption Level at Prambanan Regional General Hospital

Erlinda Nuraini^{1*}
Anton Kristijono²
Nita Budiyan³
Syarah Mazaya Fitriana⁴
Yalid Fattah Nurbuwana⁵

^{1,2,3,4} Department of Medical Records and Health Information, Health Polytechnic of
the Ministry of Health Yogyakarta, Indonesia

⁵ Prambanan Regional General Hospital, Special Region of Yogyakarta, Indonesia

*Corresponding author email: erlinda.nuraini10@gmail.com

Abstract

Digital health transformation mandates Electronic Medical Record (EMR) implementation, yet outpatient EMR adoption at RSUD Prambanan based on the Outpatient Electronic Medical Record Adoption Model (O-EMRAM) remains undetermined. This study aimed to describe outpatient EMR implementation across O-EMRAM levels 0–7 and determine the adoption level. A descriptive qualitative case study design was used. Data were collected through semi-structured interviews with five informants, non-participatory observation, and document review, with validity tested via technical and source triangulation. Results showed levels 0–4 fully met, including near-complete digitalization, authority-based access with BPJS eligibility verification via VClaim, a centralized CDR integrating laboratory, pharmacy, and radiology, real-time clinical documentation with e-prescribing, and CPOE, basic CDSS, structured SOAP documentation, and external electronic reporting. At level 5, the SAPA portal was active but usage data were unavailable; level 6 saw disease recapitulation and the PERSADIA program running but lacked advanced CDSS; level 7 achieved SATUSEHAT integration and mature governance but not paperless operations or a clinical analytics dashboard. The 2025 Digital Maturity Index (DMI) assessment showed a total score of 4.62/5.00, with an EMR component score of 4.21/5.00. Outpatient EMR adoption at RSUD Prambanan is concluded to be level 4, with a clear pathway toward optimal digital maturity.

Keywords: electronic medical record; O-EMRAM; EMR adoption; outpatient digital maturity

1. Introduction

Based on Law Number 17 of 2023 on Health, hospitals provide comprehensive individual health services, covering promotive, preventive, curative, rehabilitative, and/or palliative efforts through outpatient, inpatient, and emergency services. In addition to serving as providers of medical services, hospitals also act as centers for managing patient health data and information, including through the implementation of Electronic Medical Records (EMR), which aims to

improve the quality and efficiency of health services.

Advances in information technology have driven the transformation of health service systems from conventional to digital through EMR implementation. Based on Minister of Health Regulation Number 24 of 2022 on Medical Records, all health care facilities in Indonesia are required to implement EMR comprehensively. However, EMR implementation still faces various challenges, ranging from inadequate user training and limited infrastructure to

resistance from health workers. Successful EMR implementation depends heavily on infrastructure support, the availability of skilled human resources, and the commitment of hospital leadership (Wardana & Licia, 2025). In line with this, the readiness of organizational work culture in EMR implementation is closely related to leaders' ability to establish policies and standard operating procedures, ensure that planning workflows are understood, and mobilize staff in operating the system (Zenobia, Bhayza, & Agung, 2024).

The Ministry of Health of the Republic of Indonesia has developed the Digital Maturity Index (DMI) assessment as an instrument for measuring the digital maturity of health care facilities, in which EMR implementation is one of the important assessment dimensions. To measure EMR maturity more specifically in outpatient services, the Healthcare Information and Management Systems Society (HIMSS) developed the Outpatient Electronic Medical Record Adoption Model (O-EMRAM), an assessment model consisting of eight stages (0-7) that is hierarchical and cumulative (HIMSS Analytics, 2021).

A study using the EMRAM model at Dr. Soedjono Magelang Hospital showed that EMR implementation was at level 4, with obstacles in the optimization of the clinical decision support system (CDSS) and inter-unit integration (Ningsih, Dewi, Santoso, & Riyadi, 2024). At the international level, a study revealed that most facilities were still at an early phase of adoption, with obstacles including a lack of interoperability, limited EMR vendors, uneven infrastructure, and differences in human resource capacity (Abdulrahman, Elhassan, Abdulqader, Redha, & Almalki, 2024). This gap underscores the need to identify the level of outpatient EMR adoption in hospitals using the more comprehensive O-EMRAM model.

Evaluating EMR adoption is important considering that the Ministry of Health is currently running the DMI program to measure the digital maturity of hospitals in Indonesia, in which EMR

adoption is one of the dimensions of the DMI assessment. Evaluation using the O-EMRAM framework is needed to determine the position of outpatient EMR adoption at Prambanan Regional General Hospital, based on a standard that assesses not only the availability of systems but also the level of integration between systems, use in clinical practice, and process automation. The results of the evaluation can be used as a basis for developing future system development plans and identifying areas that need improvement. This study contributes a mapping of outpatient EMR adoption across all eight O-EMRAM stages in a regional general hospital. This context has been rarely studied compared with class A and B hospitals in previous studies.

RSUD Prambanan has implemented EMR since 2018, yet the extent to which the O-EMRAM outpatient criteria have been fulfilled, the components already met, and the areas that still need development have not been identified. Therefore, this study aimed to describe outpatient EMR implementation at each O-EMRAM stage (levels 0-7) and to determine the outpatient EMR adoption level at RSUD Prambanan, using the HIMSS O-EMRAM framework as the analytical reference.

2. Method

This was a descriptive qualitative study with a case study design, conducted in the outpatient department of RSUD Prambanan from February to April 2026. The subjects were five informants selected through purposive sampling, comprising the head of medical records, a physician, a nurse, a registration coordinator, and the head of the IT unit. Subjects were selected on the grounds that each informant had a role and knowledge related to outpatient EMR implementation in their respective work units, enabling them to provide comprehensive information to assess all aspects of EMR adoption based on the O-EMRAM criteria.

Data sources consisted of primary data obtained through interviews and observation, and secondary data obtained from document review. Data were collected using three techniques: (1) semi-structured interviews using an interview guide covering all O-EMRAM criteria for levels 0–7; (2) non-participatory observation of the menus, features, and workflows of the EMR within the Hospital Management Information System (SIMRS); and (3) document review to verify criteria that could not be assessed directly through system observation. The frequency of interviews and observations varied across informants, adjusted to the need for data clarification for each O-EMRAM criterion.

Data validity was tested through technique triangulation and source triangulation. Technique triangulation was performed by verifying interview data through system observation, or through documents for criteria that could not be observed directly, such as the disaster recovery plan. Source triangulation was applied selectively to criteria that could be answered by more than one informant, whereas criteria that were specific and could only be answered by particular informants were verified through technique triangulation.

Data were analyzed using the Miles and Huberman model, consisting of data reduction, data display, and conclusion drawing. The study applied research ethics principles, including respect for human dignity through informed consent; respect for privacy and confidentiality through anonymization of informants' identities; and justice and inclusiveness without discrimination toward research subjects. The study obtained ethical approval from the Health Research Ethics Committee of the Health Polytechnic of the Ministry of Health Yogyakarta under number DP.04.03/e-KEPK.1/150/2026.

3. Result and Discussion

Level 0: Paper-Based, Without Electronic Records

EMR implementation in outpatient services at RSUD Prambanan covers almost all service processes electronically, from registration, triage recording, examination and clinical documentation, and requests for supporting examinations, to prescribing. The only documents still processed manually are those requiring the patient's physical signature, namely the general consent and the new patient form. This is consistent with the following interview result:

"Yes, outpatient is already on EMR; what remains are the ones that still use the patient's signature. At the front desk, the general consent and the new patient form are still manual." (Informant 4, Registration Coordinator)

This near-complete digitalization of outpatient services is consistent with findings at Gotong Royong Hospital in Surabaya, which showed that EMR implementation contributed to reducing paper use and improving the efficiency of patient data recording, although some processes were still found not to be fully digitalized (Azzahra, Astuti, Djamaludin, & Okky, 2023). In accordance with Minister of Health Regulation Number 24 of 2022, which requires health care facilities to implement EMR, this condition fulfills the stipulated requirement. Therefore, based on the O-EMRAM criteria, RSUD Prambanan has surpassed level 0, which indicates that its digital infrastructure foundation is ready for advancing the system to the next stage.

Level 1: Computer Access to Online Medical References and Patient Eligibility Information

All health workers at RSUD Prambanan have access to the EMR through computers in their respective units, with username–password authentication and role-based access control (RBAC), so that each user can only access menus, features, and data in

accordance with their duties and authority.

"All staff already have SIMRS access using computers with their own usernames and passwords, and access control has also been implemented, so they can only access what corresponds to their authority." (Informant 5, Head of IT)

In accordance with Minister of Health Regulation Number 24 of 2022, which stipulates that medical record data must be accessible to authorized health workers according to their needs, the availability of computer access with authentication and RBAC constitutes fulfillment of this requirement. The success of EMR implementation is strongly influenced by the availability of infrastructure, the competence of human resources in information technology, and technical support from hospital leadership (Mukharram, Nurita, & Paramarta, 2024).

Staff can also access eligibility information from BPJS (the national health insurance) in real time through the integration of SIMRS with VClaim. This integration enables real-time membership verification, which improves verification efficiency and minimizes errors commonly occurring in manual verification (Juliantika & Wahab, 2024). Therefore, the level 1 O-EMRAM criteria have been fulfilled at RSUD Prambanan, indicating that patient data security and confidentiality have been maintained since the early stage of EMR implementation.

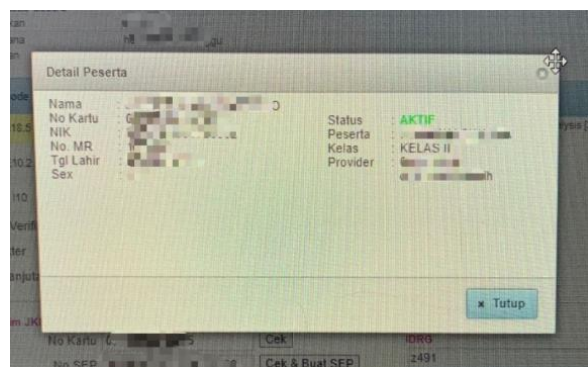


Figure 1. VClaim Bridging Interface with the EMR

Level 2: Centralized Data Repository (CDR) with Access to Examination Results and Basic Data

RSUD Prambanan has a centralized clinical data repository that can be accessed in real time by all system users. All supporting medical data, including laboratory, pharmacy, and radiology results as well as the Picture Archiving and Communication System (PACS), have been integrated into a single SIMRS, so that physicians and other health workers can access supporting results directly without switching systems.

This achievement differs from findings in a readiness study of EMR implementation at Hospital X in Bekasi, which showed that suboptimal PACS integration was one of the obstacles to fulfilling the CDR criteria (Pasaribu, Budiyaniti, & Nandini, 2024). In contrast, RSUD Prambanan has successfully integrated PACS optimally, so that radiology images and interpretations are available directly in the system.

In addition to supporting data, SIMRS also facilitates the entry of basic data, such as complete patient demographic data and electronic clinical nursing documentation covering vital signs, fall risk, nutritional status, complaints, diagnoses, interventions, and nursing care plans, so that nurses no longer record manually.



Figure 2. Interface Showing the Pharmacy, Radiology, and Laboratory Units Connected in One System

These achievements indicate that the integration of supporting data and basic patient data has accelerated the flow of clinical information without the need to switch systems between units. Therefore,

the level 2 O-EMRAM criteria have been fully fulfilled.

Level 3: Point-of-Care Clinical Documentation, Physician Access to Online Patient History, Electronic Prescribing (E-Prescribing)

Clinical recording or data entry at RSUD Prambanan is carried out directly at the point of service while the patient is being examined, with all data entry completed before the outpatient clinic closes on the same day. Real-time clinical recording at the point of service is an important part of optimal EMR implementation because it contributes to improved service efficiency and patient safety (Ayuni, Ikawati, Ansyori, & Malang, 2025).

Physicians at RSUD Prambanan also have online access to patients' previous visit histories in the system, which can be used as a reference during the visit. Access to patient history supports continuity of medical information and more accurate clinical decision-making (Ningsih et al., 2024).

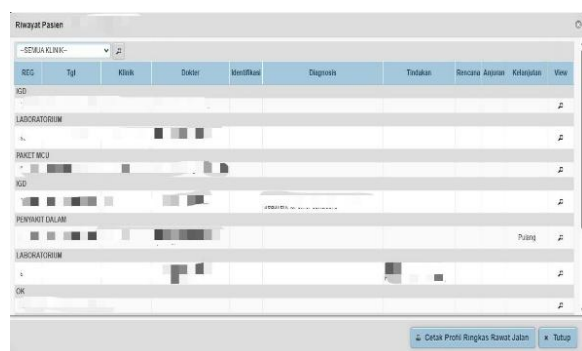


Figure 3. Patient History List Interface

Medication prescribing is also carried out electronically (e-prescribing) and connected directly to the pharmacy system without the need for paper prescriptions, replacing handwritten prescriptions that are prone to misreading. E-prescribing has been shown to be effective in reducing medication errors in health care facilities (Ulum & Hilmi, 2023). This indicates that the risk of errors resulting from manual handwritten prescriptions has been minimized. Therefore, the level 3 O-EMRAM criteria have been fulfilled.

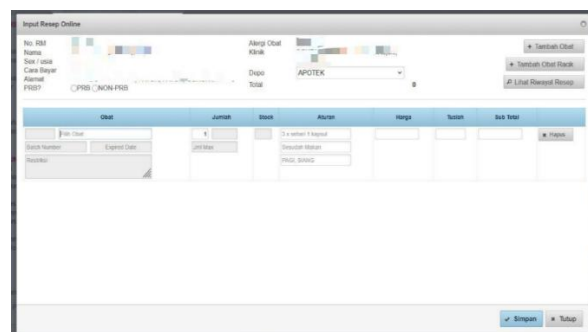


Figure 4. Online Prescription Input Interface

Level 4: Implementation of CPOE, Clinical Decision Support or Basic CDSS, Structured Documentation Format, Reporting to External Parties

The SIMRS at RSUD Prambanan has implemented Computerized Provider Order Entry (CPOE) for all medical orders electronically. CPOE implementation has been shown to be effective in reducing medication error incidents because it enables more structured and standardized processing of medical orders (Fitrawan & Fadilah, 2025).

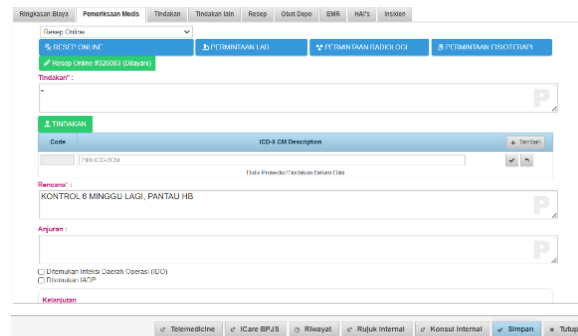


Figure 5. CPOE Interface

Clinical documentation is performed in a structured SOAP (Subjective, Objective, Assessment, Planning) format with separate fields and units, producing discrete data that serve as the basis for interaction with CDSS. RSUD Prambanan has basic CDSS in the form of automatic color indicators on laboratory results: red for values above normal, blue for values below normal, and black for values within the normal range. The implementation of this integrated CDSS feature contributes to

improving the accuracy of clinical decision-making (Rahayu, 2026).

PEMERINTAH KABUPATEN SLEMAN
Rumah Sakit Umum Daerah Prambanan
Jl. Pramono Propo No. 7, Dimpas, Sleman, Prambanan, Sleman 55572
Informasi: (0274) 4398356, (0274) 4398357, Fax: (0274) 4398370
Website: rsudprambanan.slemkab.go.id Email: rsud.prambanan@rsudprambanan.go.id

HASIL PEMERIKSAAN LABORATORIUM

No RM: 17 Tgl Periksa: 1
Nama: Tgl Masuk: 1
Tgl Lahir: 1 Cara Bayar: 1
Alamat: 1

No	Pemeriksaan	Hasil	Normal	Satuan	Metode	Ket
ELEKTROLIT						
	Chlorida darah	107.98	96 - 106	mEq/L		
	Kalium darah	3.26	3.5 - 5.50	mEq/L		
	Natrium darah	143.14	135 - 145	mEq/L		
HEMATOLOGI						
	Hematokrit (HCT)	23.4	40 - 52	%		
	Hemoglobin (Hb)	7.4	14.0 - 17.5	g/dL		
IMUNOLOGI LAIN						
	Anti HCV	NON REAKTIF	NON REAKTIF			
	HbsAg	NON REAKTIF	NON REAKTIF	IU/mL		
KIMIA KLINIK						
	Albumin	3.35	3.40 - 4.80	g/dL		
KIMIA KLINIK (FAAL GINJAL)						
	Creatinine darah	13.20*	0.7 - 1.2	mg/dL		
	Urea	112.9*	10 - 50	mg/dL		

*1 Hasil Nilai Kritis

Figure 6. Laboratory Results Display with Basic CDSS Color Indicators

Routine reporting to external parties is also carried out through the HIV/AIDS Information System (SIHA), the Tuberculosis Information System (SITB), and the Hospital Information System (SIRS) as part of the obligations of EMR implementation, although it still requires manual input into each application. This is consistent with the following interview result:

"There are many; at the Health Office there are monthly visit reports and hospital indicators, and usually the office already has spreadsheets that we just fill in. I handle HIV, the nurse handles TB; HIV uses SIHA, TB uses SITB. Then there's the patient morbidity and mortality reporting that uses SIRS, where the data come automatically from SIMRS and just need to be entered into SIRS." (Informant 1, Head of Medical Records)

Based on the fulfillment of these indicators, the level 4 O-EMRAM criteria have been fulfilled. Medical ordering, clinical decision support, and external reporting have begun to operate within a structured system, although dependence on manual input into several external applications may still create duplicated work for staff.

Level 5: Patient Portal (Website/Application), Patient Engagement Activities, and Availability of Portal User Data

RSUD Prambanan has a patient portal in the form of a web-based application called SAPA, accessible at <https://sapa.rsudprambanan.com/> since April 1, 2026, with features including registration, examination history, laboratory and radiology results, medications, follow-up schedules, and appointments. In accordance with Article 26 of Permenkes Number 24 of 2022, which states that the contents of the medical record belong to the patient, the existence of this portal reflects a commitment to fulfilling this provision. Through the SAPA application, RSUD Prambanan realizes patients' right to access their health information electronically.



Figure 7. SAPA Application Main Menu Interface

The portal is socialized through the hospital's official website, direct explanations by registration staff, and support from the information desk. This is consistent with the following interview results:

"For every patient who doesn't know or is confused, we also explain rather than just registering them. For BPJS patients we encourage them to use M-JKN, and we also explain that there is a new application, SAPA, that can be downloaded on their phones. The

information desk also usually helps to explain.” (Informant 4, Registration Coordinator)

“It already exists. When you open the hospital website, there is already an invitation to use the SAPA application, because it is no longer possible to register via WhatsApp or the website, so everything has been redirected to this SAPA application, where everything can be done.” (Informant 5, Head of IT)

These socialization efforts are appropriate, considering that low patient portal utilization is generally caused by limited digital literacy and patients’ lack of awareness in managing their own health (Carini, Villani, Pezzullo, & Gentili, 2021). However, data on active portal users to serve as material for evaluating patient engagement are not yet available. The data currently available cover all patients registered in SIMRS, not data specific to patients who have actively used the portal. This is consistent with the following interview result:

“SAPA application user data is basically all patients registered in SIMRS. A display of patients who have actually used it, that is, downloaded and logged in to the application, is not yet available.” (Informant 5, Head of IT)

Nevertheless, assessing the effectiveness of patient engagement programs through the portal cannot be based solely on the availability of the portal and socialization activities. A comprehensive evaluation requires actual usage data, including the proportion of patients actively using the portal, the most frequently accessed features, access frequency, and barriers that prevent some patients from using the service, so the availability of portal user data is a component that cannot be overlooked in assessing this level (Alfurayh, Alanazi, & Aldalham, 2025). Therefore, the level 5 O-EMRAM criteria have not yet been fully fulfilled, which implies that RSUD Prambanan’s ability to measure actual patient engagement through the portal is limited.

Level 6: Advanced CDSS Including Protocols and Clinical Pathways, Health

Status and Preventive Reminders, Medical Devices Connected to the EMR, Disease Reporting, Active Patient Engagement Program

RSUD Prambanan does not yet have advanced CDSS integrated into the system, including clinical protocols and clinical pathways that appear automatically based on patient conditions, or reminder features for preventive care. This is consistent with the following interview result:

“The clinical pathway is not in the EMR yet; it’s still manual. Automatic clinical protocols are also still not available. Not yet for something like that. There are also no medical devices yet.” (Informant 3, Nurse)

Advanced CDSS plays a strategic role in supporting evidence-based clinical decision-making because of its ability to analyze patients’ historical data to provide diagnostic recommendations, treatment options, and early warnings of potential clinical risks (Nurhayati, Suryadi, Pasa, & Purwanto, 2025). The absence of these components indicates the need for a planned and sustained development strategy.

Although an Internet of Things (IoT) menu is available in SIMRS, no medical devices are yet automatically connected to the system. On the other hand, RSUD Prambanan has disease recapitulation data that can be displayed as graphs or tables for specific periods. This is one relevant indicator of EMR implementation maturity, although the quality and depth of the information still need to be improved (Ningsih et al., 2024).

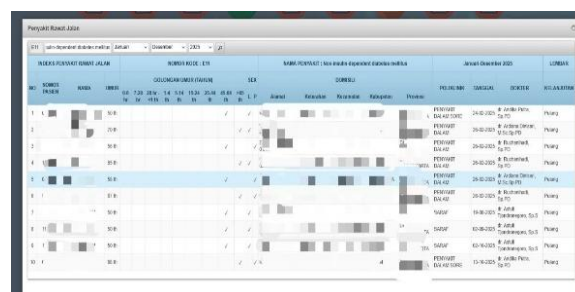


Figure 8. Per-Disease Recapitulation Report Interface

RSUD Prambanan has also run a structured and routine patient

engagement program, namely the program of the Indonesian Diabetes Association (Persatuan Diabetes Indonesia, PERSADIA) for patients with diabetes mellitus (DM). Its routine activities include group exercise, blood glucose and blood pressure checks, and health education by specialist physicians and nursing staff. Active patient involvement in structured health programs has been shown to have a significant positive impact on health behavior change and overall clinical outcomes (Marzban & Naja, 2022). Therefore, the level 6 criteria have not yet been fully fulfilled because advanced CDSS, clinical pathways, reminders, and medical device connectivity are not yet available.

Level 7: Paperless, Data Exchange with External Parties, Analytics System for Service Improvement Evaluation, Mature System Governance, Disaster Recovery Plan

Outpatient services at RSUD Prambanan have not yet fully achieved a paperless condition because some documents still require the patient's physical signature. Achieving a paperless condition is the highest and most difficult criterion to fulfill in O-EMRAM. A study in Türkiye showed that most of the hospitals studied had not yet been able to meet this criterion, with the main obstacles being limited technological capacity, availability of funding, and the complexity of comprehensive digitalization (Tekerek & Isik, 2025). The condition faced by RSUD Prambanan therefore reflects the reality of digital transformation, which generally requires time and sustained commitment from all stakeholders.

Figure 9. New Patient Form and General Consent

SIMRS has been integrated with SATUSEHAT, the national Health Information Exchange (HIE) platform, for transmitting basic data, visits, examinations, and supporting data. In accordance with Permenkes Number 24 of 2022, which requires EMR implementation to be connected to the national health interoperability platform, this integration meets the regulatory mandate, although direct data exchange between systems from different vendors is not yet possible.

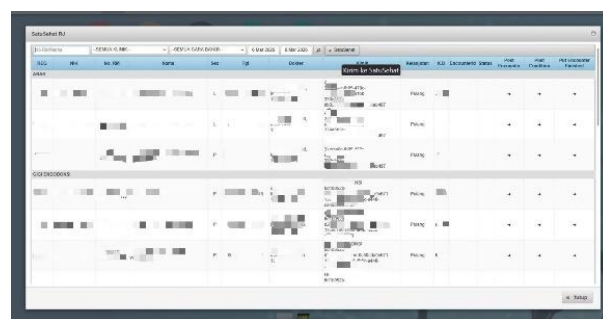


Figure 10. SIMRS-SATUSEHAT Bridging Interface

The reporting dashboard at RSUD Prambanan is still limited to descriptive operational data and cannot yet display clinical analytics showing measurable patient progress. This is consistent with the following informant statement:

"Something like that doesn't exist yet. The patient data is already there and complete, but a system that could show how many DM patients have controlled blood sugar after a certain period, or changes in patient condition over time, that doesn't exist yet." (Informant 2, Physician)

This condition reflects a limitation commonly found in EMR systems, which are generally not yet equipped with the capability to process data into clinical information that can be used strategically in evaluating service quality (Bowyer et al., 2026).

In terms of governance, RSUD Prambanan has standard operating procedures (SOPs) for software and hardware repair, as well as automatic daily data backup on a separate server. In accordance with Minister of Health Regulation Number 24 of 2022, which requires facilities that store digital data to maintain periodic data backups, this implementation fulfills the stipulated requirement. In addition, SOPs for planned and unplanned downtime are available, along with uninterruptible power supplies (UPS) on all service computers, reflecting good technical support and commitment from hospital leadership.

This indicates that RSUD Prambanan has established a mature interoperability and governance foundation, although the use of clinical data for analytics and the paperless condition remain challenges to be addressed gradually. Therefore, the level 7 criteria have not yet been fully fulfilled because the paperless condition and a clinical analytics dashboard have not been achieved, even though the HIE and system governance components have been fulfilled.

Outpatient EMR Adoption Level at RSUD Prambanan

Based on the identification of all O-EMRAM stages from level 0 to 7, RSUD Prambanan has fulfilled all criteria at levels 0 through 4, while at levels 5, 6, and 7 a number of criteria have not yet been fulfilled, as described above. Referring to the hierarchical and cumulative principle of O-EMRAM, the outpatient EMR adoption level at RSUD Prambanan is level 4.

Table 1. O-EMRAM Level Fulfillment Results

Level	Description	Conclusion
0	Paper-Based, Without Electronic Records	Fulfilled
1	Computer Access to Online Medical References and Patient Eligibility Information	Fulfilled
2	Centralized Data Repository (CDR) with Access to Examination Results and Basic Data	Fulfilled
3	Point-of-Care Clinical Documentation, Physician Access to Online Patient History, Electronic Prescribing (E-Prescribing)	Fulfilled
4	Implementation of CPOE, Clinical Decision Support or Basic CDSS, Structured Documentation Format, Reporting to External Parties	Fulfilled
5	Patient Portal (Website/Application), Patient Engagement Activities, and Availability of Portal User Data	Not Yet Fulfilled
6	Advanced CDSS Including Protocols and Clinical Pathways, Health Status and Preventive Reminders, Medical Devices Connected to the EMR, Disease Reporting, Active Patient Engagement Program	Not Yet Fulfilled
7	Paperless, Data Exchange with External Parties, Analytics System for Service Improvement Evaluation, Mature System Governance, Disaster Recovery Plan	Not Yet Fulfilled

Source: Criteria adapted from HIMSS Analytics (2021); status based on primary research data (2026)

These achievements show that EMR implementation has been operational, and that several criteria at higher levels have begun to be developed even though they have not been fully fulfilled. This is consistent with the view that EMR implementation is a gradual process influenced by infrastructure readiness, human resource competence, and the availability of financial support (Mukharram et al., 2024).

As supporting data, the 2025 DMI assessment of RSUD Prambanan showed a total score of 4.62/5.00, with an EMR component (component VII) score of 4.21/5.00, the Standards and Interoperability and Governance components each scoring 5.00/5.00, and the Data Analytics component scoring 4.33/5.00. The perfect DMI score in the Standards and Interoperability component reflects the successful integration of SATUSEHAT, while the limitation in the Data Analytics component indicates that data utilization can still be improved.

Nevertheless, level 4 on the O-EMRAM scale (0–7) cannot be directly equated with the DMI score, given the differences in scale and indicators between the two instruments. Level 4 on the O-EMRAM does not represent a low level of adoption, because at levels 5, 6, and 7 a number of components have begun to be implemented even though not all of their criteria have been fulfilled. Overall, the results of both instruments indicate that EMR implementation at RSUD Prambanan has been running well, but there is still room for development to achieve more optimal maturity.

4. Conclusion

The outpatient EMR adoption level at RSUD Prambanan is level 4. All criteria for levels 0 through 4 have been fulfilled: near-complete digitalization, an integrated centralized CDR including PACS, real-time clinical recording, e-prescribing, CPOE, basic CDSS, structured SOAP

documentation, and electronic reporting to external parties such as the Health Office.

At level 5, the SAPA portal is available, but data on active users for evaluation do not yet exist. At level 6, disease recapitulation and the PERSADIA program are running, but advanced CDSS, clinical pathways, care reminders, and medical device connectivity are not yet available. At level 7, SATUSEHAT integration and mature system governance have been fulfilled, but the paperless condition and a clinical analytics dashboard have not been achieved.

RSUD Prambanan is recommended to develop recording of SAPA portal user data to support evaluation of patient engagement, gradually integrate clinical pathways into SIMRS, achieve a paperless condition by digitizing the general consent and new patient forms, and develop a clinical analytics dashboard to support measurable evaluation of service improvement.

5. Acknowledgements

The authors thank RSUD Prambanan for the permission and facility support provided during data collection, and all informants for their time and the information provided during the interviews and observations. Thanks are also extended to the Health Polytechnic of the Ministry of Health Yogyakarta for academic support.

6. References

- Abdulrahman, M., El-hassan, O., Abdulqader, M., Redha, A., & Almalki, M. (2024). Adoption of Electronic Medical Records in Healthcare Facilities in the Emirate of Dubai. *Healthcare Informatics Research*, 30(2), 154–161. <https://doi.org/10.4258/hir.2024.30.2.154>
- Alfurayh, G. H., Alanazi, A. T., &

- Aldalham, H. S. (2025). Feasibility of Using Patient Portal to Enhance Patient Engagement and Patient-Generated Data in Tertiary Hospital. *Healthcare*, 13(5), 518. <https://doi.org/10.3390/healthcare13050518>
- Ayuni, S., Ikawati, F. R., Ansyori, A., & Malang, K. (2025). Implementation of electronic medical records in hospitals. *Jurnal Kesehatan Amanah*, 8, 224–231. <https://doi.org/10.57214/jka.v8i1.723>
- Azzahra, A., Astuti, W., Djamaludin, R., & Okky, K. (2023). Implementation of outpatient electronic medical record use at Gotong Royong Hospital Surabaya 1,2,3,4. 1(1), 17–24.
- Bowyer, S. A., Pissaridou, E., Booth, J., Key, D., Bryant, W. A., Sheldon, E., ... Sebire, N. J. (2026). A platform for generating clinical intelligence from routine health data in hospitals: PICTURE. *Future Healthcare Journal*, 13(September 2025). <https://doi.org/10.1016/j.fhj.2025.100492>
- Carini, E., Villani, L., Pezzullo, A. M., & Gentili, A. (2021). *The Impact of Digital Patient Portals on Health Outcomes , System Efficiency , and Patient Attitudes : Updated Systematic Literature Review Corresponding Author*: 23, 1–20. <https://doi.org/10.2196/26189>
- Fitrawan, L. O. M., & Fadilah, N. (2025). High alert medication management to prevent medication errors. *Lansau : Jurnal Ilmu Kefarmasian (LJIK)*, 3(1), 59–75. <https://doi.org/10.33772/lansau.v3i1.44>
- HIMSS Analytics. (2021). *Outpatient Electronic Medical Record Adoption Model (O-EMRAM) Criteria*. Retrieved from <https://www.himss.org/sites/hde/files/media/file/2021/06/04/himss-o-emram-criteria.pdf>
- Juliantika, T., & Wahab, S. (2024). Analysis of the hospital management information system (SIMRS) integrated with VClaim to support the effectiveness of SEP creation. *Jurnal Kesehatan Masyarakat*, 8, 4693–4699.
- Marzban, S., & Naja, M. (2022). *Impact of Patient Engagement on Healthcare Quality: A Scoping Review*. <https://doi.org/10.1177/23743735221125439>
- Mukharham, M. F., Nurita, D. P., & Paramarta, V. (2024). Implementation of electronic medical records in hospitals. *Journal of Social and Economics Research*, 6(1), 966–973. <https://doi.org/10.54783/jser.v6i1.471>
- Ningsih, K. P., Dewi, T. S., Santoso, S., & Riyadi, S. S. (2024). Electronic Medical Record Adoption Model (EMRAM) in Dr.Soedjono Magelang Hospital. *Infokes: Jurnal Ilmiah Rekam Medis Dan Informatika Kesehatan*, 14(2), 91–99. <https://doi.org/10.47701/infokes.v14i2.4009>
- Nurhayati, Suryadi, A., Pasa, I. Y., & Purwanto, M. A. (2025). Literature study: The contribution of electronic medical records and clinical decision support systems in supporting clinical decision-making. *Prosiding Seminar Informasi Kesehatan Nasional (SIKESNas)*, (24), 280–293.
- Pasaribu, T. E., Budiyaniti, R. T., & Nandini, N. (2024). Analysis of readiness for electronic medical record implementation at Hospital X Bekasi using the DOQ-IT and EMRAM approaches in 2023. *Media Kesehatan Masyarakat Indonesia*, 2024(23), 54–60. <https://doi.org/10.14710/mkmi.23.1.54-60>
- Permenkes RI No. 24 (2022). *Regulation of the Minister of Health of the Republic of Indonesia Number 24 of 2022 concerning Medical Records*.

- Retrieved from
<https://peraturan.bpk.go.id/Details/245544/permenkes-no-24-tahun-2022>
- Rahayu, E. P. (2026). *Critical analysis of the application of multi-criteria-based CDSS and data mining in nursing decision support systems: A literature review of 15 journals* 4(1), 23–28.
- Tekerek, B., & Isik, O. (2025). Exploring the Digitalization of Hospitals Upon the EMRAM Model: The Case of Türkiye. *Sakarya University*, 13. <https://doi.org/10.22139/jobs.1593092>
- Ulum, K., & Hilmi, I. L. (2023). *Implementation and evaluation of electronic prescribing to reduce medication errors*. 6(1), 191–198.
- UU RI No. 17. (2023). *Law of the Republic of Indonesia Number 17 of 2023 concerning Health*. Retrieved from <https://peraturan.bpk.go.id/details/258028/uu-no-17-tahun-2023>
- Wardana, C. K., & Licia, R. (2025). Evaluation of electronic medical record implementation on improving outpatient service quality at PKU Muhammadiyah Gombong Hospital. *Jurnal Kesehatan Tropis Indonesia*, 03(03), 142–154. Retrieved from <https://journal.larpainstitute.com/index.php/jkti>
- Zenobia, E., Bhayza, P., & Agung, J. T. (2024). *Analisis Kesiapan Pelaksanaan Rekam Analysis of electronic medical record implementation readiness using the Doctor's Office Quality–Information Technology (DOQ-IT) method at Kajen Regional General Hospital, Pekalongan Regency* 7(1), 40–52.