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Implementation of electronic medical records and data use for puskesmas decision-making in Jayapura City

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Abstract

Purpose: Electronic medical records (EMRs) are central to Indonesia's digital health transformation, but adoption alone does not ensure that routinely collected data inform action. In Puskesmas, patient data should support continuity of care, service improvement, program management, and recognition of disease-risk patterns in communities. This study examined whether EMR implementation in Puskesmas in Jayapura City had progressed from electronic recording to organizational data use. **Methods:** We used an explanatory sequential mixed-methods design. A cross-sectional survey included 114 staff members from 14 Puskesmas in Jayapura City between May and July 2025. The survey measured reported EMR use, perceived ease of use, data security and quality, and the main implementation barrier. Semi-structured interviews with six management and frontline informants explored how staff used EMR data in routine work. Survey data were summarized using frequencies and percentages, and interview data were analyzed thematically to explain the quantitative patterns. **Results:** Most respondents reported using the EMR (93.9%), finding it easy to use (96.5%), having secure patient data (96.5%), and reporting good data quality (83.3%). The most frequently reported barriers were limited training (37.7%), system-integration difficulties (21.9%), and limited internet connectivity (20.2%). Interviews indicated that EMRs mainly supported registration, clinical recording, and patient flow; routine use of EMR data for program planning and management review remained limited. Training gaps, duplicate entry across non-interoperable systems, connectivity problems, and inadequate hardware kept staff focused on recording rather than analysis. **Conclusion:** Jayapura City's Puskesmas have established electronic recording, but not yet routine data-informed management. Puskesmas managers should institute regular data-review meetings, assign responsibility for interpreting indicators and following up decisions, and train staff beyond data entry. The City Health Office should support interoperability, infrastructure, and supervision of data use. A further agenda is to convert aggregated, privacy-protected patient information into locally relevant risk profiles that Puskesmas teams can discuss with village and kampung leaders, so clinical care is linked with community action that reduces recurring exposure and illness.

Keywords: electronic medical records; implementation; Jayapura City; primary health care

INTRODUCTION

Puskesmas need timely, accurate, secure, and usable information to manage patient flow, medicine availability, laboratory services, follow-up care, program reporting, and coordination across service units. Electronic medical records (EMRs) can make clinical information more accessible and support continuity and efficiency in routine care [1,2]. However, their management value depends on whether staff and managers can convert electronic records into information that guides action. EMR implementation does not automatically make a Puskesmas a data-informed organization. A facility may comply with electronic-recording requirements while still using the data mainly for documentation and upward reporting. The critical implementation transition is therefore from entering records to reviewing information, identifying service problems, deciding what should change, and following up on those decisions.

Patient records and population-health action should form one learning cycle. Clinicians use individual records to diagnose, treat, and follow patients. Puskesmas teams can then aggregate privacy-protected data to identify recurring conditions, missed follow-ups, clusters, and differences between villages or kampungs. Indonesian studies show that routine information becomes more useful when systems are designed around management questions, area mapping, program evaluation, and early warning rather than around data entry alone [3–6]. The same data can therefore connect treatment with prevention: a Puskesmas treats people who are ill while helping local leaders recognize and reduce the conditions that keep producing illness.

This broader use requires Puskesmas to present information that community decision-makers can act upon. Heads of villages and kampungs do not need patient-level clinical details; they need a concise and ethical picture of where risk is increasing, which population groups are affected, what environmental or social conditions may be involved, and what joint action should follow. Indonesian evidence on Desa Siaga emphasizes that Puskesmas has a facilitation role, although community development is difficult when teams lack facilitation skills [7]. The data function is therefore not complete when a report has been sent upward. It is complete when responsible actors can understand a problem, decide what to do, and review whether the action reduced risk.

The Indonesian government has required health care facilities, including Puskesmas, to implement Electronic Medical Records. This policy encourages health facilities to move from manual records to digital records that are more standardized, connected, and secure [8]. Within the broader agenda of digital health transformation, EMR is expected to support improved data quality, patient data security, service coordination, and health reporting. The SATUSEHAT platform also shows the government’s effort to build a more integrated health data ecosystem across health facilities [9].

The policy problem is how to ensure that mandatory EMR implementation does not stop at administrative compliance. Local governments and District Health Offices need to know whether Puskesmas have sufficient managerial capacity to use EMR sustainably. This capacity includes user readiness, regular training, technical support, internet connection, hardware availability, system integration, and data governance. Previous studies show that EMR implementation can be limited by weak infrastructure, limited staff competence, lack of training, system integration problems, and technical support challenges [10–12]. Without these supports, EMR may be used when required, but it may not fully support service decisions.

Evidence from Jayapura City is needed because geographically dispersed services and variable digital infrastructure may shape how national digital-health requirements work in daily Puskesmas practice. User acceptance, perceived security, and perceived data quality show whether basic adoption conditions are present [13,14]. They do not, by themselves, demonstrate that managers use the resulting information to review performance or improve services. It remains unclear how far Jayapura City's Puskesmas have progressed from electronic recording to using data in management decisions. A socio-technical perspective treats this transition as an organizational process involving users, workflows, leadership, technology, and the policy environment rather than as technology adoption alone [15]. This perspective directs attention to both the basic conditions for adoption and the routines through which managers interpret information and act on it.

This study aims to describe the implementation of Electronic Medical Records in Puskesmas in Jayapura City, focusing on EMR readiness to support data use for Puskesmas decision-making. (a) First, it described reported EMR use, user experience, perceived patient-data security and quality, and implementation barriers. (b) Second, it explored how users and managers experienced the transition from routine recording to using EMR information in service review

and management decisions. (c) The study then derived management implications from the integrated findings.

METHODS

Study design, setting, and participants

This study used an explanatory sequential mixed-methods design. A cross-sectional survey first described EMR implementation, perceived readiness, and barriers. Semi-structured interviews then explored how staff experienced these conditions and why favorable adoption indicators did or did not translate into management use of EMR data. The study was conducted in 14 Puskesmas under the Jayapura City Health Office. Data were collected from May to July 2025. The study population included health workers and staff involved in service delivery, administration, and health information management at the Puskesmas. They consisted of heads of Puskesmas, heads of administration, health information system officers at the registration unit, doctors, laboratory officers, cluster coordinators, and pharmacists. The total population was 114 respondents. This study used total sampling, so all 114 eligible respondents were included as the study sample.

Data collection

Primary data were collected using a structured questionnaire. The questionnaire collected information on respondent characteristics and EMR implementation. Respondent characteristics included sex, age, and length of work. EMR implementation was assessed using several key indicators: whether the Puskesmas used EMR; users' perceptions of patient data security and quality after EMR implementation; users' experiences with EMR; and barriers encountered during EMR implementation.

The EMR implementation indicators were selected to align with the study objective, which was to assess whether EMR had moved beyond electronic recording and had the basic conditions to support data use in Puskesmas decision-making. The level of EMR use was measured by asking whether EMR was used at the Puskesmas. Perceived patient data security was measured by asking whether respondents agreed that patient data were secure after EMR implementation. Perceived data quality was measured by asking whether patient data quality was good or less good after EMR implementation. User experience was measured by asking whether the system was easy or difficult to use. Implementation barriers were measured by asking respondents to identify the main challenge they experienced, including a lack of user training, difficulty with system integration, limited internet connectivity, limited hardware, limited technical support, and high implementation costs.

The qualitative component used a semi-structured, in-depth interview guide to deepen the quantitative findings presented in Table 2. The guide covered four areas: operational readiness and user experience; patient data security and access control; quality of clinical information; and socio-technical barriers, including training, system integration, internet connectivity, and hardware. Six informants were selected to represent management and operational perspectives: a head of Puskesmas, a registration-unit coordinator, a doctor, a nurse, a laboratory officer, and a pharmacy officer. Interviews lasted approximately 30–45 minutes, allowed probing questions, protected informant confidentiality through coded identifiers, and ended with a brief member check to confirm the interviewer's understanding of key points. The interview material was organized thematically to explain how EMR was actually used in daily work and what limited its movement from recording to management use.

Data analysis

Quantitative data were analyzed using univariate analysis and presented as frequencies and percentages. Qualitative interview material was organized thematically and compared with the patterns shown in Table 2. Integration occurred during interpretation: survey findings identified the main strengths and barriers, while interview findings explained how these conditions shaped routine EMR use. The analysis focused on the gap between successful electronic recording and the organizational capacity to turn EMR data into information for service improvement and management decisions. The Ethics Committee of the Faculty of Public Health, Cenderawasih University, Jayapura approved this study (Approval No. 201/KEPK-FKM UC/2025). This research was also granted approval by the Jayapura City Health Office under Approval No. 440/5023/SDK/2025.

RESULTS

Study participants and sources of evidence

The study drew on two linked sources of evidence. The survey included 114 health workers from 14 Puskesmas and described the distribution of EMR adoption, perceived ease of use, security, data quality, and implementation barriers (Table 1).

Table 1. Characteristics of respondents

Variable	n	%
Sex		
Male	17	14.9
Female	97	85.1
Age group		
Young age, 25–34 years	26	22.8
Middle age, 35–44 years	48	42.1
Senior working age, 45–59 years	40	35.1
Length of work		
More than 3 years	24	21.1
Less than 3 years	90	78.9
Total	**114**	**100.0**

Table 3. Implementation of EMR, data security, data quality, user experience, and implementation barriers in 14 Puskesmas in Jayapura City

Variable	n	%
EMR implementation in Puskesmas		
Yes, using EMR	107	93.9
No, not using EMR	7	6.1
Patient data security after EMR implementation		
Agree	110	96.5
Less agree	4	3.5
Patient data quality after EMR implementation		
Good	95	83.3
Less good	19	16.7
User experience in using EMR		
Easy	110	96.5
Difficult	4	3.5
Barriers to EMR implementation		
Lack of user training	43	37.7
Difficulty in system integration	25	21.9
Limited hardware	13	11.4
Limited internet connection	23	20.2
Limited technical support	8	7.0
High cost	2	1.8
Total	**114**	**100.0**

The qualitative component included six informants representing management, registration, clinical care, laboratory, and pharmaceutical work. The survey established the implementation pattern, while the interviews examined how EMR was used in daily work and why favorable adoption indicators did or did not lead to management use of data. The high proportion of respondents with less than three years of service makes structured induction and continuing support particularly relevant to EMR implementation (Table 1). The six informants were not intended to represent the prevalence of views across all Puskesmas (Table 2). Their organizational positions were selected to explain how the survey pattern was produced across managerial and frontline work (Table 2).

Quantitative findings

Table 3 presents the reported implementation of EMR, users' perceptions of data security and quality, their experience of using the system, and the main barriers encountered across 14 Puskesmas. The overall pattern indicates that EMR was already available and used in routine Puskesmas work: 93.9% of respondents reported that EMR had been implemented, while most described the system as easy to use, secure, and capable of producing good-quality patient information.

What is consistent—and what is paradoxical—in Table 3?

The findings were internally consistent in showing that the Puskesmas had passed the initial adoption threshold. High reported implementation aligned with perceived ease of use (96.5%), perceived security (96.5%), and favorable data quality (83.3%). Together, these indicators suggest that staff had accepted EMR as part of routine patient recording and service delivery. The barriers, however, reveal an important inconsistency within this favorable profile. Lack of training (37.7%), system-integration difficulties (21.9%), limited internet connectivity (20.2%), inadequate hardware (11.4%), and limited technical support (7.0%) persisted even though most users considered EMR easy to operate. The apparent paradox, then, is not that staff rejected the system. Staff could enter and retrieve records, while the organizational and technical conditions needed to integrate, interpret, and use the resulting information remained incomplete.

This inconsistency matters because disease records and medical records should do more than document individual encounters. Puskesmas need this information to identify repeated illness, missed follow-up, service gaps, and risk patterns among the population they serve. A system can therefore be present and routinely used while contributing little to prevention if the data stop at entry, individual care, or upward reporting. Table 3 cannot explain how this gap was produced; the qualitative findings were needed to show what staff did with the data, how the barriers interacted, and why information use stopped mainly at the recording stage.

Qualitative findings: explaining the gap between adoption and data use

The interviews explained the apparent contrast in Table 3. Staff valued EMR because it made registration and clinical information easier to manage, but this operational achievement did not create a routine for analysis and decision-making. Four themes showed how acceptance, data control, documentation quality, and connected socio-technical barriers shaped the transition from recording to data use (Table 4).

Table 2. Characteristics of qualitative informants

Code	Category	Role	Length of work	Age (years)	Sex
IK-01	Key informant	Head of Puskesmas	>3 years	48	Female
IK-02	Key informant	Registration Unit Coordinator	<3 years	32	Male
IU-01	Main informant	Doctor	<3 years	29	Female
IU-02	Main informant	Nurse	>3 years	41	Female
IP-01	Supporting informant	Laboratory Officer	<3 years	27	Female
IP-02	Supporting informant	Pharmacy Officer	<3 years	30	Male

Table 4. Qualitative themes, illustrative quotations, and explanatory contribution

Theme	Substantive pattern and explanatory value	Illustrative quotation
Theme 1. Easy routine use, limited decision use	Ease of use supported registration and clinical entry. It did not establish routines for aggregated analysis, program planning, or management evaluation; this explains why 96.5% perceived ease could coexist with limited data-informed management.	*"We still use it mainly to enter patient care data so the queue can keep moving. We have not yet used the integrated data for program planning or management evaluation." — IU-01, Doctor*
Theme 2. Stronger digital control of patient information	Individual accounts and digital traces reduced vulnerabilities associated with paper files. The theme explains perceived security, but it reflects user experience rather than an independent security audit.	*"Now each health worker has an individual user ID and password, so there is a clear digital trail and patient confidentiality is better protected." — IK-01, Head of Puskesmas*
Theme 3. Clearer information, workload-related gaps	Readable histories improved continuity and reduced ambiguity. High service volume could still reduce completeness, qualifying the positive survey rating of data quality.	*"The challenge is that when patient volume is very high, staff may work too quickly and record patient complaints in less detail." — IU-02, Nurse*
Theme 4. Connected barriers keep staff at the recording stage	Limited analytic training, duplicate entry, unstable internet, and inadequate hardware reinforced one another. These conditions consumed time and kept responsibility centered on data entry rather than interpretation and action.	*"We only understand the basic recording functions, while the data analysis and evaluation functions are never optimized." — IP-02, Pharmacy Officer*

Theme 1. EMR is easy to use, but data use stops mainly at recording

High perceived ease of use reflected operational acceptance rather than management use of data. The doctor and registration coordinator described faster data entry, record retrieval, and patient flow. Neither account described a routine in which teams aggregated information, reviewed performance, assigned decisions, and monitored follow-up. The interviews therefore explain why ease of use was high while data-informed management remained limited.

Theme 2. Data security moved from physical vulnerability to digital access control

Perceived security improved because access responsibility became more visible. Informants contrasted exposed or misplaced paper files with credential-based access and individual user accounts. This experience explains the high survey rating of data security, although the study did not audit permissions, access logs, confidentiality breaches, or technical safeguards.

Theme 3. Clinical information became clearer, but completeness still depends on workload

Clinical information became clearer and easier to retrieve, which supported continuity of care. However, the nurse described how high patient volume could shorten documentation and reduce detail. The interviews therefore qualify the positive data-quality rating: readability improved, but completeness still depended on workload and workflow.

Theme 4. Socio-technical barriers keep EMR at the recording stage

The barriers worked as a connected mechanism rather than as separate inconveniences. Limited training kept staff at basic entry functions; weak interoperability produced duplicate work; and unstable internet and limited hardware interrupted service. Together, these conditions consumed staff attention and left little protected time or assigned responsibility for analysis, discussion, and follow-up action.

Integrated findings

The two evidence streams converge on a specific implementation gap. Puskesmas had achieved broad electronic recording and favorable user acceptance, but had not yet established the organizational routines that convert records into management information. The interviews explain that the gap did not arise from a single resistant user or isolated technical problem. It arose because analytic capability, interoperability, infrastructure, time, and managerial responsibility were not yet organized as one data-use system. The integrated finding shifts the practical question from "Is

EMR being used?" to "What decisions are made from EMR information, who acts on them, and what happens next?" This question provides the bridge from implementation results to the management and policy implications discussed.

DISCUSSION

This study's main contribution is distinguishing between electronic adoption and organizational data use. Jayapura City's Puskesmas reported high use, perceived ease, perceived security, and perceived data quality, yet qualitative findings showed that the EMR remained centered on registration, clinical documentation, and patient flow.Adoption therefore created a usable digital foundation, but the organization had not completed the next transition: turning routinely produced information into questions, decisions, assigned action, and review. This distinction extends the national digital-health agenda from compliance with electronic recording toward demonstrated use of information [8,9].

Puskesmas managers are the missing organizational link between available data and changed work. Technology acceptance explains why staff can and will use a system [13,14], but it does not specify who reviews patterns or changes services. The integrated findings suggest a practical management cycle: teams begin with a decision question, review a small set of relevant indicators, test the quality of the underlying data, interpret differences across services or territories, assign an action and responsible person, and return at an agreed date to assess change. Future research should directly observe these routines before concluding that managerial capability causes better data use.

The Jayapura City Health Office should support data use as both a technical and managerial function. Individual Puskesmas cannot resolve interoperability, connectivity, hardware, or help-desk problems alone, and these barriers can reinforce one another [10–12,16–18]. The Health Office can reduce this burden while also changing supervision. Supervisors should ask not only whether records are complete, but which pattern the team identified, what decision followed, who was responsible, and whether the next review showed improvement. Simple dashboards, peer learning, routine data-quality review, and protected analytic time can make this expectation feasible.

Evidence from other Indonesian settings helps distinguish user acceptance from the broader capacity of health information systems. At Puskesmas Sidomulyo in Samarinda, perceived usefulness and ease of use were positively associated with actual e-Puskesmas EMR use [19]. At the provincial level, an evaluation in Central Java identified inadequacies in health information system governance, resources, data sources, and data management, despite an adequate overall assessment [20]. Together, these findings support attention to both user acceptance and organizational capacity when interpreting the implementation gap observed in Jayapura.

Local and central government should align digital infrastructure with local decision needs. SATUSEHAT and standardized records can strengthen continuity and comparison, but duplicate entry and one-way reporting can consume the same capacity needed for local analysis [9,21]. Productive alignment therefore means that national systems reduce repeated work, local systems can retrieve useful information, and data-governance arrangements protect confidentiality and integrity [15,22]. The relevant measure of alignment is not merely successful transmission upward, but whether trustworthy information returns to the people responsible for improving services and reducing risk.

From patient records to public-health action in kampungs

EMR can connect two responsibilities that Puskesmas should not separate. Health workers use individual records to diagnose, treat, refer, and follow patients. Managers can use privacy-protected aggregates to identify repeated illness, missed follow-up, service gaps, and geographic concentrations. Indonesian studies show how territorial and surveillance data can guide TB logistics, malaria risk classification, immunization evaluation, and early warning [3–6]. These examples do not prove that Jayapura's Puskesmas already perform this function; they show a feasible direction for extending the digital foundation observed in this study.

Community use requires Puskesmas to translate data without transferring patient records. Village and kampung leaders need a concise picture of trends, affected groups, risk locations, and actionable conditions, not identifiable clinical details. Puskesmas teams can discuss this territorial brief with cadres, schools, sanitation actors, and other relevant organizations, agree on action, and set a review date. This facilitation role is consistent with Indonesian experience in Desa Siaga, while also reminding us that mobilization is not the same as building community capacity [7].

The proposed pathway therefore keeps treatment and prevention in one learning cycle. Patient care produces information; Puskesmas management converts appropriate aggregates into a territorial

question; local actors reduce environmental or social risks; and the partners review whether exposure, missed care, or recurring disease declined. The pathway in Table 5 is a management implication, not an observed outcome of this study. Its value is to make the next empirical question visible: can Puskesmas and kampung leaders use protected, relevant information to prevent the same conditions from continually reproducing illness? This study has several limitations. The cross-sectional survey described perceptions and reported use but could not establish causal relationships or independently verify system use, security, or data quality. Six qualitative informants provided organizationally varied explanations, but the interviews were not designed to represent every Puskesmas or to estimate how common each experience was. The study did not directly observe data-review meetings, dashboard use, decisions, follow-up action, or communication with villages and kampungs. Future studies should trace a complete data-to-action episode through system logs, documents, meeting observation, interviews, and review of whether agreed actions changed services or community risk.

Table 5. A proposed data-to-action pathway for Puskesmas and kampung collaboration

Level of use	Question answered	Information product	Action and responsible actor
Patient care	What does this patient need now and at follow-up?	Clinical history, diagnosis, treatment, result, referral and follow-up list	Clinician and care team adjust treatment and ensure continuity.
Puskesmas management	Where are delays, missed services, repeated illness, or quality gaps?	Simple trend, cohort, service-gap and follow-up dashboard	Head of Puskesmas and program teams change workflow, staff support, supplies, or outreach.
Village/kampung preparedness	Which risks are recurring, where, and among whom?	Aggregated, privacy-protected territorial brief with trends and risk locations	Village/kampung head and local actors organize environmental, social, communication, or preparedness action.
Joint learning	Did the agreed action reduce exposure, missed care, or recurring disease?	Short action log linked to reviewed indicators and a review date	Puskesmas and community leaders review results, adapt action, and document learning.

CONCLUSION

This study shows that successful EMR adoption does not automatically create a data-driven Puskesmas. In Jayapura City, EMR has become part of routine recording and patient flow, and users generally perceive the system as easy to use, secure, and able to improve patient information. However, EMR data are not yet routinely transformed into information for program planning, service review, and management decisions. The main challenge for Puskesmas is therefore no longer simply adopting EMR. Puskesmas need to develop management routines that connect data with action. These routines include regularly reviewing service data, discussing emerging problems, assigning clear responsibility for decisions, and following up on agreed actions. Training should also move beyond basic data entry to interpreting and using data for service management.

The Jayapura City Health Office has an important role in making this transition possible. It should support Puskesmas not only with infrastructure and technical assistance, but also with supervision, data review processes, interoperability, and managerial development. Local government support is needed for infrastructure, financing, and organizational capacity. In contrast, alignment with the central government should ensure that national digital systems strengthen local decision-making rather than create additional reporting burdens.

The next organizational question is whether Puskesmas can make patient data useful to the communities from which patients come. Puskesmas should protect individual confidentiality while producing concise territorial information on recurring disease, missed care, and local risks. Heads of villages and kampungs can use this information to prepare collective action with health workers and other local actors. In this way, data remain part of healing patients while also helping communities reduce the conditions that continually reproduce illness. This study therefore shifts attention from EMR adoption to the organizational work required after adoption. Digital health becomes useful to Puskesmas only when electronic records are converted into management information, discussed by responsible teams, and used to improve services.

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