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Evaluating electronic medical records in inpatient psychiatric services using the PIECES framework

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ABSTRACT

This study evaluated the implementation of Electronic Medical Records (EMR) in inpatient psychiatric services at RSJ Mutiara Sukma using the PIECES framework. Employing a qualitative approach, data were collected through in-depth interviews and observations involving twelve informants from various healthcare professions. Thematic analysis identified systemic challenges across six domains: performance, information, economy, control, efficiency, and service. Key issues included slow system response times, fragmented data presentation, dual documentation, limited audit trails, inefficient workflows, and gaps in user training. Despite having an EMR infrastructure, its utilization remained suboptimal due to usability and integration barriers. The study underscores the need for user-centered design, continuous training, and institutional support to optimize EMR systems in psychiatric settings. These insights are essential for enhancing digital health strategies in mental health care.

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INTRODUCTION

The digital transformation of health information systems has become a key priority in improving the quality, accessibility, and continuity of care. In Indonesia, the government continues to promote the integration of Electronic Medical Records (EMR) across health facilities, including mental health hospitals, as part of its national e-health roadmap (Noviathie, 2022)(Zein & Septiani, 2024). EMR enables structured data documentation, facilitates clinical decision-making, and enhances communication across health service units . However, the implementation of EMR in mental health settings—particularly in inpatient psychiatric services—faces unique challenges due to the complexity of patient conditions and the sensitive nature of psychiatric documentation (Andhani et al., 2024)(Daud, Sagala, Sutarno, & Sutrisno, 2024).

RSJ Mutiara Sukma, the main psychiatric referral hospital in West Nusa Tenggara Province, has implemented EMR in its inpatient care services to improve data accuracy and patient

monitoring (Norzi, Yamin, & Hartono, 2023)(Wida, 2020). Despite this initiative, observations indicate that the adoption remains inconsistent, with ongoing reliance on manual records, partial system use, and limited integration across departments. Staff resistance, lack of technical support, and the absence of system standardization have contributed to these challenges. Understanding these dynamics requires a structured evaluation of the current EMR system from multiple perspectives within the institution (Wida, 2020)(Muhammad Wali et al., 2023).

The PIECES framework—standing for Performance, Information, Economy, Control, Efficiency, and Service—provides a comprehensive model for evaluating information systems (Natalia, Pusparini, & Sarumaha, 2024)(Setyaningsih & Fajar, 2024). Originally developed for organizational system analysis, PIECES is increasingly applied in healthcare settings to assess the functional and operational aspects of EMR systems. This framework allows institutions to identify not only technical flaws but also procedural and human-centered issues that hinder successful implementation (Prasetya, 2024)(Aulia & Budiarti, 2024). By examining EMR through the PIECES lens, healthcare organizations can prioritize improvements that align with user needs and system goals (Irmawati, 2023)(Arya & Rahayu, 2021).

This study aims to evaluate the EMR implementation at RSJ Mutiara Sukma using the PIECES framework. The research seeks to uncover systemic gaps and practical challenges in the inpatient psychiatric service setting and to formulate evidence-based recommendations for optimizing the EMR system. The novelty of this study lies in its focus on psychiatric care—a domain often overlooked in digital health research—and its use of PIECES as a tool for multidimensional system assessment. The findings are expected to guide institutional decision-makers in refining EMR strategies and to contribute to broader discussions on digital transformation in mental health services.

RESEARCH METHOD

Research Design

The study was conducted from January to March 2025 and focused on analyzing the experience and perspectives of healthcare personnel using EMR in psychiatric inpatient care. The unit of analysis included health workers directly involved in EMR operations, such as doctors, nurses, medical record staff, and IT personnel. The flow of the research is described in the following pseudocode to illustrate the systematic progression from participant selection to final analysis:

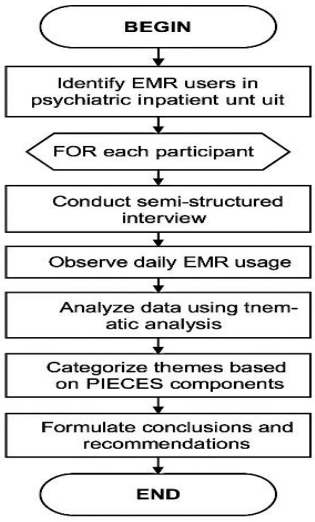

Figure 1. Research procedure flowchart

This figure illustrates the step-by-step procedure followed in the research to evaluate Electronic Medical Record (EMR) implementation in the psychiatric inpatient unit at RSJ Mutiara Sukma. The process began by identifying healthcare personnel who actively used the EMR system. Each participant was involved in semi-structured interviews and was observed during their routine interactions with the system. Challenges and system-related issues were documented throughout the data collection process.

Following data acquisition, thematic analysis was applied to identify emerging patterns, which were then categorized according to the six components of the PIECES framework: Performance, Information, Economy, Control, Efficiency, and Service. The process concluded with the formulation of conclusions and recommendations for improving EMR implementation in mental health care settings.

Data Collection Procedure

Data were collected through: (a) Semi-structured interviews with 12 key informants from various professional roles. (b) Direct observations of EMR usage within the psychiatric inpatient setting. (c) Review of institutional documents, including EMR user manuals, SOPs, and internal reports related to system performance. Each interview lasted approximately 30–45 minutes and was recorded with the informants' consent. Field notes were also taken during observation to capture workflow patterns and system interaction behavior.

Data Analysis

The collected data were transcribed and analyzed thematically following Braun and Clarke's six-step method: familiarization, initial coding, theme generation, theme review, defining themes, and reporting. Themes were then mapped to each PIECES domain. Table 1 summarizes the thematic alignment with PIECES categories.

Table 1. Thematic findings based on PIECES framework

PIECES Component	Emerging Themes
Performance	System speed, data processing interruptions
Information	Incomplete patient records, limited access
Economy	Resource inefficiency, double documentation
Control	Data validation gaps, lack of user log trails
Efficiency	Time delays, redundant workflow
Service	Limited technical support, no 24/7 helpdesk

Ethical Considerations

The study obtained ethical clearance from the institutional ethics board. All participants provided informed consent and were assured confidentiality and anonymity.

RESULTS AND DISCUSSIONS

The results of this research are presented narratively and thematically according to the six components of the PIECES framework, which include Performance, Information, Economics, Control, Efficiency, and Service. Data were gathered through in-depth interviews and direct observation with 12 informants consisting of health workers from various professions in the inpatient psychiatric ward at RSJ Mutiara Sukma. The findings provide a holistic view of the EMR system implementation from the perspective of actual users in the field.

Data analysis in this study followed a qualitative thematic approach, consisting of four stages: data collection, data reduction, data display, and conclusion drawing. Data collection was carried out through in-depth interviews, direct observation, and document analysis over a period of three months. Interviews were transcribed and supplemented with field notes. During the data reduction phase, raw data were coded manually by identifying significant statements and

grouping them according to the PIECES framework. Each code was labeled using abbreviations such as "P" for Performance, "I" for Information, and so forth. The grouped data were then summarized into themes that represented the main issues encountered by informants.

Data display was carried out in the form of narrative descriptions and summary tables to facilitate interpretation and thematic alignment. Triangulation was applied to validate the credibility of the findings by cross-checking data from multiple sources and using different techniques. Finally, conclusions were drawn based on the thematic patterns that emerged across all PIECES dimensions, and findings were verified through member checking with key informants.

Performance

The EMR system at RSJ Mutiara Sukma displayed moderate performance with certain technical limitations. Users noted occasional lags, particularly during peak hours, though most delays were tolerable, with response times typically under 30 seconds. This latency was linked to the ongoing use of LAN cables; the IT department had proposed transitioning to fiber optic networks in 2024 to improve data transmission speed. Downtime was infrequent but typically occurred due to weather-related issues, power outages, or service interruptions from Telkomsel. Scheduled system maintenance, usually held on weekend mornings every three months, often disrupted EMR input for several hours. Users recommended that such updates be conducted during nighttime to minimize service disruption.

Information

In terms of information quality, participants noted that the data presented in the EMR was often difficult to interpret due to an unintuitive layout. Accessibility to patient histories and progress notes was hindered by multi-step navigation processes. Although the system stored comprehensive patient data, the presentation format did not align with the needs of psychiatric practitioners. In some cases, data inaccuracies occurred due to manual entry errors that went undetected in the absence of validation features. This compromised the reliability of clinical information used for decision-making. While medication records included validation features to help detect errors, other data fields lacked real-time validation, resulting in mistakes such as misclassification of patient status. For example, some patients were incorrectly recorded as discharged rather than transferred, causing discrepancies between system records and manual census reports. Additionally, integration with laboratory and radiology systems had not yet been implemented, delaying access to supporting diagnostic data.

Economics

While the EMR system reduced paper use and simplified data archiving, efficiency gains were offset by limited infrastructure. Staff continued to engage in dual documentation—manually recording data before later inputting it into EMR—due to the shortage of available computers. Psychologists reported difficulty in uploading assessment documents because the system lacked a file attachment feature, forcing them to deliver physical reports manually. These gaps highlight missed opportunities for resource optimization and increased workload.

Control

The EMR system allowed user-based access control through login credentials. However, password sharing in emergency scenarios weakened data security protocols. Although some data corrections, such as date and time edits, were possible, certain forms restricted changes, and duplicate entries had to be deleted by IT personnel. The system did not support detailed audit trails or role-based activity logs, making it difficult to monitor changes and ensuring accountability.

Efficiency

Despite automating several workflows, the EMR system had not fully streamlined inpatient documentation. Some users had to wait their turn to access the system, as computer availability was limited. In certain cases, doctors used personal computers or completed documentation remotely. Senior psychiatrists often input data from home for specific forms. The system rarely experienced complete outages—typically just a few instances per month—but delays often led staff to revert to manual notes temporarily, which were later transcribed into the EMR.

Service

Contrary to early assumptions of weak IT support, the study found that the IT department at RSJ Mutiara Sukma was responsive and well-organized. The support team worked in shifts, including weekends, and handled technical complaints efficiently through WhatsApp groups or remote access solutions. Staff were instructed to send photos of error messages (e.g., black screen) to facilitate faster troubleshooting. Additionally, the IT team conducted scheduled hardware maintenance and consisted of specialized staff for both hardware and software. Nonetheless, ongoing user training and simplified system interfaces were still needed to improve usability and user satisfaction.

Overall, the findings confirm that EMR adoption at RSJ Mutiara Sukma has made substantial progress but continues to face operational, usability, and training-related challenges. By addressing these issues, especially infrastructure upgrades and user-centered system improvements, the psychiatric unit can enhance its digital transformation journey.

CONCLUSION

This study set out to evaluate the implementation of Electronic Medical Records (EMR) in the inpatient psychiatric unit of RSJ Mutiara Sukma using the PIECES framework. The expectation stated in the introduction was to explore how EMR performance, information quality, economic value, control mechanisms, efficiency, and service delivery aligned with the practical needs of mental health services.

The results confirmed that while the EMR system provided foundational digital infrastructure, its utilization remained suboptimal across multiple dimensions. Performance issues such as system slowness and low error tolerance disrupted documentation accuracy. Information was often difficult to access and presented in non-intuitive formats, while economic benefits were undermined by dual documentation practices. Control and data security were weak due to password-sharing and the absence of audit trails. The system lacked efficiency in both functionality and technical maintenance, and service quality was hampered by limited training and poor user interface design.

These findings indicate that successful EMR adoption in psychiatric care requires not only the presence of digital tools but also alignment with institutional workflows, robust training systems, data governance protocols, and responsive technical support. The PIECES framework proved effective in highlighting critical areas needing improvement.

Future studies are encouraged to expand the scope to multi-institutional settings, involve longitudinal evaluations, or explore integration strategies with national health systems. The development of adaptive EMR platforms tailored to the unique demands of mental health facilities remains a promising direction for innovation and system enhancement.

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