

Evaluation of the Implementation of the Hospital Management Information System at Sentra Medika Hospital, Cikarang, West Java, Indonesia

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ABSTRACT

Background: Sentra Medika Cikarang Hospital migrated from Avicenna to Teramedic in December 2024. Initial evaluations revealed infrastructure constraints, user literacy, and interface complexity that impacted system effectiveness.

Objective: To measure the effectiveness of the implementation of Teramedic SIMRS through quantitative and qualitative analysis, and to formulate optimization recommendations.

Subjects and Method: Convergent mixed methods design: cross-sectional survey (n = 111 respondents) for variables of wait time, data accuracy, interface, organizational support, satisfaction; and in-depth interviews with 15 key informants from IT, inpatient, medical records, pharmacy, and HR units. Quantitative data were analyzed using descriptive statistics, paired t-tests, and multiple linear regression. Qualitative data were analyzed thematically.

Results: The survey showed an average reduction in clinical data wait time from 110 (SD= 15) to 86 (SD= 12) minutes ($p < 0.001$), an increase in medical record accuracy from 92% to 97% ($p < 0.01$), and an average user satisfaction score of 4.1/5. Regression analysis confirmed that digital literacy ($\beta = 0.45$, $p < 0.001$) and organizational support ($\beta = 0.37$, $p < 0.001$) significantly influenced satisfaction. Qualitative findings identified four main themes: infrastructure challenges (power outages, network), user adaptation and training, UX/UI design, and module integration.

Conclusion: Teramedic SIMRS improves efficiency and data quality, but infrastructure and interface barriers need to be addressed through UPS upgrades, redundant networks, ongoing e-learning modules, and periodic UX/UI audits.

Keywords: SIMRS, teramedic, implementation evaluation, electronic medical records, operational efficiency

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BACKGROUND

The rapid development of information technology is driving digital transformation in the

healthcare sector, particularly in hospitals in Indonesia. Adopting a Hospital Management Information System (SIMRS) is a strategic

choice to improve operational efficiency, minimize manual errors, and accelerate clinical and administrative workflows. With adequate IT infrastructure support, hospitals can leverage real-time data for more accurate decision-making. This transformation also opens up opportunities for more integrated healthcare innovations based on patient-added value (Sudiantini et al., 2023).

SIMRS implementation is not simply a matter of replacing software; it requires a comprehensive reengineering of business processes across each service unit. This process involves restructuring workflows, assigning new tasks, and changing organizational culture to encourage technology adoption. The main challenge often arises in the form of user resistance in the field, either due to a lack of understanding of the system's functions or concerns about changing workloads. Therefore, a change management strategy and ongoing training are key to a successful implementation (Tallupadang and Veranita, 2024).

The Indonesian government through Law No. 44/2009 concerning Hospitals and Regulation of the Minister of Health No. Law No. 82/2013 concerning Electronic Medical Records requires hospitals to implement standardized information systems to ensure the integrity of patient data. This policy is designed to support interoperability between healthcare facilities and ensure the security and confidentiality of electronic medical records. This regulation requires both private and public hospitals to adapt their internal systems and processes to comply with the applicable legal framework (Rusdi and Ularan, 2023).

In addition to meeting regulatory requirements, an integrated SIMRS enables the rapid and accurate exchange of clinical information between service units. This allows for more effective diagnosis, therapy, and patient monitoring, reducing medical errors

caused by fragmented data. The availability of historical patient data also strengthens epidemiological analysis and targeted healthcare planning. System security features, such as encryption and role-based access rights, ensure that patient data is accessible only to authorized parties (Sari et al., 2016; Santosa et al., 2023).

Sentra Medika Cikarang Hospital first adopted the Avicenna SIMRS in 2019 as an initial step in digitizing its services. Over the five years of use, the system has proven to improve data access speeds, but it also left issues with server capacity and limited integration modules. To address these challenges, on December 1, 2024, the hospital decided to migrate to the Teramedic platform, which offers broader features and process automation capabilities.

Teramedic was selected as the new system based on a comparison of the functionality of its clinical, nursing, pharmacy, and medical records management modules. Teramedic also offers guaranteed 24/7 technical support and flexible training options, both virtual and in-person. Furthermore, Teramedic promises improved system performance with its cloud-based architecture and infrastructure redundancy to minimize downtime.

Although various studies have evaluated the implementation of SIMRS, research using a comprehensive, mixed-approach approach in private hospitals remains limited. Most literature focuses on technical or qualitative aspects separately, without a holistic integration of the results. This study combines quantitative and qualitative analysis to provide concrete operational and strategic recommendations for hospital management.

This study uses the HOT-FIT (Human, Organization, Technology-Fit) model and Lean Healthcare principles to evaluate the system's suitability to user needs and the efficiency of business processes. The HOT-FIT model emphasizes the importance of human

and organizational factors in the success of information technology implementation. Meanwhile, Lean Healthcare helps identify wasteful time and resources, allowing system improvements to be focused on increasing value streams.

This study aims to (1) evaluate operational effectiveness and data quality after migration to Teramedic; (2) identify supporting and inhibiting factors for implementation; and (3) formulate recommendations for improvement based on empirical evidence. The research problem is broken down into three main research questions addressing waiting time efficiency, medical record accuracy, and user satisfaction levels. Each question is expected to address the needs of hospital management in improving service performance.

The results of this study are expected to provide practical insights for other hospital managements planning to migrate to their SIMRS, particularly in the private sector. Furthermore, this research contributes to the development of HOT-FIT and Lean Healthcare theories in the context of healthcare technology in Indonesia. The findings and recommendations are expected to serve as a reference for policymakers, information system vendors, and academics in the field of healthcare administration.

SUBJECTS AND METHOD

1. Study Design

This study used a convergent mixed methods design according to Creswell and Clark (2023), which combines quantitative and qualitative components simultaneously to produce a comprehensive understanding of the factors influencing user satisfaction after the Teramedic SIMRS migration. Quantitative and qualitative data were analyzed separately and then combined using a joint display technique to triangulate and identify congruences and discrepancies in the findings. The study was

conducted on a population of active Teramedic SIMRS users at Sentra Medika Hospital, Cikarang in 2025.

2. Population and Sample

The population in this study was all professionals and staff who actively use SIMRS Teramedic, including doctors, nurses, pharmacists, service administration staff, and HR personnel. Of the target population, 154 active users of SIMRS Teramedic were accessible and met the inclusion criteria. The quantitative sampling technique used simple random sampling to select representative respondents. The sample consisted of 111 respondents. The qualitative sampling technique used purposive sampling by selecting key informants who had relevant roles/knowledge regarding the implementation of SIMRS Teramedic. The qualitative sample consisted of 15 key informants selected from the following units: IT, inpatient, medical records, pharmacy, and HR. The selection criteria for qualitative informants were based on their ability to provide relevant information about SIMRS implementation.

3. Research Variables

The variables in this study are user satisfaction with SIMRS Teramedic (dependent variable), and waiting time for accessing clinical data, accuracy of medical records, interface design, and organizational support (independent variables).

4. Operational Definition

User satisfaction: overall perception of the performance and benefits of teramedic; measured by subscales of a 30-item questionnaire (mean score per respondent).

Clinical data access waiting time: average time (minutes) for data access before and after migration, comparison tested with paired t-test.

Medical record accuracy: proportion of correct medical record entries before and after; changes were statistically tested.

Interface design/Usability: usability score on a scale of 1–5 covering navigation, consistency, and operational steps.

Organizational support. Perceptions of the availability of training, technical support, and managerial policies.

Digital literacy (predictor). Confidence in using IT; measured through digital literacy items and significantly predicts satisfaction.

5. Study Instrument

The research instrument consisted of a combination of quantitative and qualitative instruments to meet the triangulation objectives. The main quantitative instrument was a 5 point Likert format closed-ended questionnaire (-30 items) designed to measure clinical data access wait time (pre–post migration), medical record accuracy, usability /interface, organizational support, digital literacy, and user satisfaction. The questionnaire was validated by a panel of IT experts and tested for internal reliability (Cronbach's α value > 0.70). The qualitative instrument was a semi-structured interview guide (10 open-ended questions) structured based on the HOT-FIT (Human, Organization, Technology–Fit) framework to explore user experiences, infrastructure barriers, training needs, UX/UI perceptions, and module integration. Interviews were recorded, transcribed, and analyzed thematically through open–axial–selective coding stages to extract themes and subthemes. In addition, daily operational observations (downtime checklist , service disruption duration, training attendance documentation) and system data extraction

(downtime logs, server response time) were conducted as secondary data for triangulation.

6. Data Analysis

Quantitative analysis included descriptive statistics (frequency, percentage, mean, and SD) for respondent characteristics and construct scores, comparison of pre- and post-migration conditions was analyzed using paired t-test, and determinants of user satisfaction were identified using multiple linear regression. Prior to testing, data quality checks were conducted, as well as statistical assumption tests including residual normality, linearity, homoscedasticity, and multi-collinearity. All tests were two-tailed with a significance level of $\alpha = 0.05$ and processed using Stata software.

7. Research Ethics

The study has obtained ethical approval under Number 002537/Universitas Medika Suherman/2025. All participants were provided with complete information regarding the study's objectives, data confidentiality, and participant rights, and signed an informed consent prior to participation.

RESULTS

1. Respondent Characteristics

Table 1 shows the demographic distribution and work experience of respondents to the quantitative survey (n = 111). The majority of respondents were nurses (42%), followed by doctors (28%), administrative staff (15%), pharmacists (10%), and human resources (5%). The average length of service at Sentra Medika Cikarang Hospital was 6.2 years (SD= 2.5).

Table 1. Respondent Characteristics

Characteristics	n	%
Gender		
Man	47	42.3
Woman	64	57.7
Profession		
Doctor	31	27.9

Characteristics	n	%
Nurse	47	42.3
Pharmacist	11	9.9
Administrative staff	17	15.3
HR	5	4.5
Mean of length of service (years)	6.2 (SD= 2.5)	

2. Quantitative Survey Results

Table 2 summarizes the comparison before and after the Teramedic SIMRS migration on five key indicators. All variables showed significant improvements based on a paired t-

test ($\alpha = 0.05$). Furthermore, multiple linear regression identified digital literacy ($\beta = 0.45$, $p < 0.001$) and organizational support ($\beta = 0.37$, $p < 0.01$) as the main predictors of user satisfaction, with $R^2 = 0.52$.

Table 2. Quantitative Survey Results

Variables	Before (Mean & SD)	After (Mean & SD)	p
Waiting Time (minutes)	110 (15)	86 (12)	<0.001
Medical Record Accuracy (%)	92 (4)	97 (2)	0.002
Interface Usability (1–5)	3.2 (0.6)	4.0 (0.5)	<0.001
Organizational Support (1–5)	3.5 (0.7)	4.1 (0.6)	<0.001
User Satisfaction (1–5)	3.8 (0.7)	4.1 (0.5)	0.010

3. Observation Results

Daily observations in three units (inpatient, medical records, and pharmacy) recorded an average network downtime of 3.2 times per week, an average duration of 25 minutes, and the implementation of monthly e-learning

training with an average attendance of 68% of total users.

4. Qualitative Interview Results

Thematic analysis yielded four main themes and nine subthemes, as detailed in Table 3.

Table 3. Qualitative Interview Results

Main Theme	Subtheme	Illustrative Quotes
Infrastructure	Power Outage	"If the power goes out, the system immediately hangs."
	Network Connectivity	"Connection drops while inputting data, frustrating."
Adaptation & Training	E-learning Module	"The video tutorials are helpful, but need updating."
	Face-to-Face Training	"The workshop was too short, it needs to be longer."
UX/UI Design	Menu Navigation	"Too many clicks for one function."
	Display Consistency	"Different icons, confusing."
Module Integration	Synchronization of Laboratory Data & Medical Records	"Lab results are sometimes late in coming in."
	Pharmacy & Radiology Module	"Prescriptions and radiology reports are not yet integrated."

5. Synthesis of Findings

Although the current hospital SIM (Teramedic) works faster and more accurately,

network and display issues still frequently occur, making daily use less smooth. Therefore, steps need to be taken, such as

fixing system glitches so that service is less likely to be down or slow, conducting training that is easier for all staff to understand so they feel more confident using the system, and conducting regular reviews of the interface design to ensure the display remains user-friendly and practical.

DISCUSSION

Significant efficiency improvements in clinical data access after migration to Teramedic, which aligns with the Lean Healthcare principle of eliminating wasteful process time (Ferdias, Budiawan, and Susanto, 2017). A study by Uliansyah et al., (2024) reported a reduction in waiting times at two clinics in Indonesia, with an average reduction of 15-20 minutes for patient waiting time and 25-30 minutes for patient service duration. This supports our findings, which show a 21.8% reduction ($\bar{x} = - 24$ minutes).

The increase in medical record accuracy metrics from 92% to 97% confirms that system digitization can minimize data entry errors. These results are consistent with research by Aprilianingsih et al. (2022) , which states that the use of electronic medical records can reduce the rate of data input errors compared to manual ones. The use of a digitally integrated online registration application has been shown to reduce patient data input errors because ID card data is immediately synchronized without the need for manual re-input, compared to conventional recording systems that are prone to human error .

Infrastructure issues, particularly power outages and network downtime , pose a significant operational hurdle. Wijaya (2022) stated that power outages are one of the information technology risks outlined in ISO 31000:2018. Power outages cause significant downtime and risk damaging devices; therefore, every computer needs to be equipped with a UPS, and hospitals are

required to install automatic generators so that when the power goes out, employees have time to save data and safely shut down devices, thus minimizing operational disruptions and hardware damage.

From an organizational support perspective, an increased score indicates the effectiveness of management interventions in facilitating the change process. This aligns with the findings of Hasibuan & Wicaksono (2024), who emphasized the role of transformational leadership in the success of SIMRS implementation. Direct support from top management contributes to improved user morale and compliance.

Regression analysis highlights digital literacy as a determining factor in user satisfaction, consistent with (Firdaus, Khaerani, and Wijaya, 2025) who explained that a high digital literacy coefficient indicates that staff's ability to use the system significantly influences satisfaction with SIMRS; the higher the literacy, the smoother the use and the fewer errors. Organizational support such as policies, training, and technical assistance are also important to help staff apply digital knowledge in their work. Therefore, improving digital literacy needs to be supported by the organization so that SIMRS implementation is successful and satisfactory for users.

Teramedic's more intuitive UX/UI design compared to its predecessor received a usability score of 4.0, in line with the results of Azizi et al., (2021) which showed that improvements in interface elements, particularly in aspects of user control, error prevention, and flexibility of use, significantly reduced the number of heuristic violations and increased the effectiveness of user interactions with the hospital information system. By adopting Nielsen's heuristic evaluation principles in its UX/UI design, Teramedic successfully eliminated major daily operational obstacles such as confusing

navigation and unintuitive workflows, thereby achieving a surge in user satisfaction.

These results are also consistent with the study by Teshnizi et al., (2020) where the subscales “Conformity with user expectations” and “Controllability” were the strongest factors influencing the system usability assessment (mean > 3.4 on a scale of 1–5). Teramedic’s achievement of a usability score of 4.0 indicates that its new design successfully aligns its appearance and functionality with staff expectations and work styles, while providing adequate control over the process flow—two aspects proven to be crucial for increasing user trust and productivity. Overall, the integration of heuristic improvements with user-centered design principles has proven effective in maximizing the usability of the MISRS in a hospital setting.

Regarding module integration, the study results show that SIMRS Teramedic recorded an average synchronization time of 5 minutes, indicating the need for API optimization and service architecture restructuring. This finding aligns with Fahlevi & Anugrah (2021), who, through SOA-based REST - API integration between SIMRS and LIS, successfully eliminated the need for duplicate input and accelerated laboratory service flow. Although they still encountered bugs in error capture due to primary key mismatches between systems. Restructuring master mapping and database normalization are crucial steps to ensure endpoint data consistency, minimizing errors during test result delivery while accelerating the integration process.

Qualitative findings confirm that user perceptions of face-to-face training are still inadequate, in line with Kirkpatrick in Fakhrudin's research, (2022) showing that the results of this study indicate that in evaluating Kirkpatrick's training program model, four stages or levels must be passed, namely reaction, learning, behavior, and

results. The training program evaluation process is a continuous series that starts from planning including curriculum preparation, then preparations such as managing schedules, facilities, media, and tools, continuing to the implementation of training (Diklat), until finally the evaluation activity itself is carried out. Sentra Medika Hospital needs to review the training program including the duration, intensity, schedule, and content of the workshop.

The results of the study on the organizational support variable for the implementation of the Hospital Management Information System (MIS) showed an increase (mean= 0.6; $p < 0.001$). Consistent with the research of Karida & Dhamanti (2024), which emphasized that a strong organizational culture that includes effective communication, clear policies, and the provision of resources positively influences employee performance and commitment in hospitals. This increase in perceived support likely reflects management's success in providing ongoing training, mentoring, and adequate technical services, in accordance with best practice recommendations outlined in the literature review.

Overall, the combination of quantitative and qualitative data enriches a holistic understanding of Teramedic's SIMRS implementation. Recommendations for improvement are not only technical but also strategic, including infrastructure enhancements, user experience design, advanced training programs, and change management interventions.

AUTHOR CONTRIBUTION

All authors have made significant contributions to the data analysis and preparation of the final manuscript.

CONFLICT OF INTEREST

The author declares that there is no conflict of interest whatsoever related to this research.

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