

Redesign of the user Interface of the Electronic Medical Record System at Elisa Inpatient Clinic, Malang City

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Abstract

Introduction: Electronic medical record implementation requires an easy-to-use and efficient interface that supports accurate, integrated patient data management. At Elisa Inpatient Clinic, problems include duplicate records, limited patient search, complex navigation, and slow system response. **Objective:** This study aimed to redesign the electronic medical record interface using User-Centered Design and develop a flexible patient search feature. **Method:** A Research and Development approach with User-Centered Design was applied through context identification, requirements analysis, design development, and evaluation. Data were collected through interviews and observations involving three users. Wireframes and interactive prototypes were developed using Figma, and usability was evaluated using the System Usability Scale. **Results and Discussion:** The prototype covered registration, medical records, patient search, record merging, referrals, and other services. Fuzzy matching improved search flexibility. The mean System Usability Scale score was 70.0. **Conclusion:** The redesigned interface showed acceptable usability and provides a foundation for further electronic medical record development and implementation.

Introduction

Advancements in information technology within the healthcare sector are driving healthcare facilities to transition from manual medical records to Electronic Medical Records (EMR). Medical record information systems play a crucial role in enhancing the quality of healthcare services by providing patient data quickly, accurately, and in an integrated manner. Under the Regulation of the Minister of Health of the Republic of Indonesia Number 24 of 2022 concerning Medical Records, every healthcare facility is required to implement EMR systems to improve service quality and ensure the security, confidentiality, and availability of medical record data. Furthermore, the implementation of national interoperability via the SATUSEHAT platform necessitates that healthcare facility information systems be capable of integration using the HL7 FHIR (Fast Healthcare Interoperability Resources) standard, thereby enabling secure and standardized health data exchange.

Elisa Inpatient Clinic, located at Jalan Danau Toba E5 No. 22, Sawojajar, Kedungkandang District, Malang City, has implemented a desktop-based Electronic Medical Record (EMR) system to support daily operations. However, a preliminary study revealed various obstacles hindering service efficiency and data accuracy. The current system is not integrated with the SATUSEHAT platform, requiring staff to enter data twice into two separate systems. Furthermore, the patient search function at the registration desk only supports searches based on name prefixes; consequently, variations in name formatting, typos, or the use of middle names can lead to the creation of new medical record numbers for the same patient. This situation can result in patient data duplication and compromise the integrity and interoperability of the health information system. (Sihite et al., 2024). Another issue identified is the system's interface design, which relies on an overlapping window mechanism; consequently, critical information is frequently obscured by other windows, hindering users from accessing data quickly and in an organized manner. This disrupts the concentration of medical personnel when entering SOAP (Subjective, Objective, Assessment, Plan) data, slows down the documentation process, and increases the risk of input errors factors that can ultimately compromise the quality of care and patient safety.

Darmawan, Sanjaya, & Istiono (2024) demonstrate that EMR systems not designed in alignment with healthcare professionals' workflows can lead to service inefficiencies and increased administrative workloads. Consequently, the User-Centered Design (UCD) approach is frequently employed in the development of health information systems to ensure the resulting systems better meet user needs. (Robertson et al., 2024). Syafiq et al. (2024) demonstrated that designing the UI/UX of a medical record application using a User-Centered Design (UCD) approach involving user needs identification, prototyping, and iterative usability evaluation can enhance documentation efficiency and reduce patient data input errors. Klau (2025) also found that UCD-based UI/UX design improves system accessibility and accelerates the digitization of medical records, particularly regarding the management of complex data prone to duplication. However, previous studies have primarily focused on interface design and general system integration, without specifically examining mechanisms to prevent patient data duplication through fuzzy matching search approaches integrated with HL7 FHIR standards (Cahill et al., 2025).

Addressing these issues, this study aims to redesign the interface of the Electronic Medical Record (EMR) system at Elisa Inpatient Clinic by applying a User-Centered Design approach and incorporating a patient search feature based on fuzzy matching to minimize data duplication. The primary focus is to develop an EMR system design that is effective, efficient, and secure, while supporting the continuous improvement of service quality and patient safety.

Method

This study employs a Research and Development (R&D) approach specifically a qualitative method aimed at developing and testing the effectiveness of a particular product: in this case, an information system interface design (Rahayu, 2025). The development model employed is User-Centered Design (UCD), an approach that places user needs at the core of every stage of system design. According to Luthfi & Arfiani (2024), the UCD process comprises four steps: (1) specifying the context of use; (2) specifying user and organizational requirements; (3) producing design solutions; and (4) evaluating the design against user requirements. The study involved three respondents who were users of the Electronic Medical Record (EMR) system. The respondent selection process was based on predefined criteria relevant to their involvement and experience in using the EMR system, and the specific selection method and criteria should be clearly stated to ensure transparency and reproducibility of the study. Given the small number of respondents, the findings are not intended to represent all EMR users but rather to provide in-depth user perspectives for the development and evaluation of the interface design. Therefore, the results should be interpreted within the context of these participants and cannot be generalized to the entire population of EMR users.

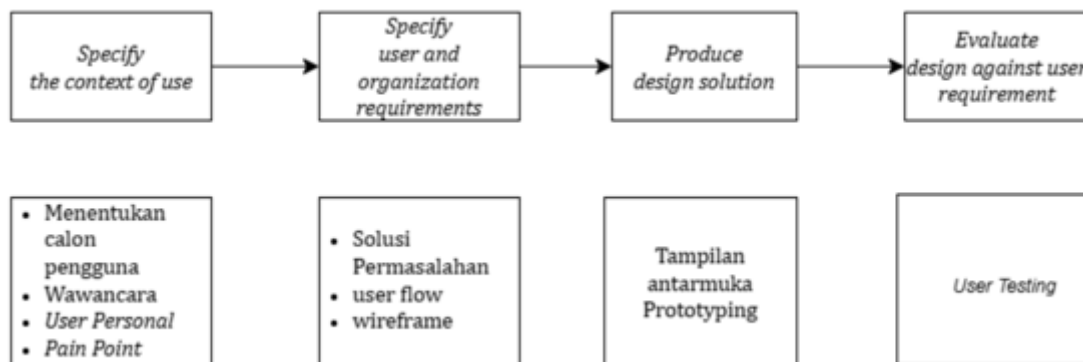


Figure 1. Stages of the User-Centered Design (UCD) Method

Result and Discussion

Menentukan konteks penggunaan (specify the context of use)

Based on interviews conducted with users of the electronic medical record system at Elisa Clinic in Malang City aimed at understanding the context of the system's use in supporting service delivery three respondents were identified who utilize the system across multiple service units. The interviews were conducted to gather information regarding the system users, their roles and tasks, the service stages involving the system, locations of use, work environment conditions, purposes of use, and obstacles affecting system usage. The findings regarding the context of electronic medical record system usage at Elisa Clinic are presented in Table 1.

Table 1
List of Questionnaire Questions

Questions	Results
Who uses the electronic medical record system at Elisa Clinic?	Interview results indicate that the system is used by several service units, namely medical record staff, counter/administrative staff, doctors, nurses, laboratory staff/analysts, the pharmacy, and referral staff.
What are your roles and responsibilities regarding the use of the system?	R1 uses the system to confirm patient data, enter patient details, and complete SOAP notes. R2 uses the system to register patients, view medical records, check patient identities, and process internal laboratory referrals. R3 uses the system for patient registration, cashier payments, and patient data confirmation.
At which stages of service is the system used (registration, examination, etc.)?	The system is utilized across various stages of service, including patient registration, physician examinations, diagnosis recording, prescription and pharmacy services, laboratory testing, referrals, patient procedures, prescription transmission, laboratory test requests, and cashier payments.
Where is the system typically used (room/work unit)?	The system is used in several work units: the medical records unit, registration counter, doctors' rooms, nurses' station, laboratory, and pharmacy.
What are the working environment conditions like when using the system (noisy, time-constrained, etc.)?	Interview results indicate that service volume is quite high, particularly in the morning. R1 noted that peak activity occurs between 07:00 and 12:00, especially on Mondays, Fridays, and Saturdays. R3 stated that the system sometimes experiences slow response times when patient volume is high.
What is the primary purpose of using the electronic medical record system at Elisa Clinic?	The three respondents stated that the system is used to reduce the use of physical or paper medical records, facilitate the work of staff and doctors, and save service time.
Do working environment conditions affect system usage? Explain.	Interview results indicate that environmental conditions and infrastructure affect system usage. Heavy rain, power outages, and network or Wi-Fi issues can cause the system to slow down or become unusable. When the system is unavailable, staff perform registration manually and subsequently enter the data into the system once it is operational again.

Interview results indicate that users require an electronic medical record system capable of supporting service delivery in an easy, fast, and efficient manner, and featuring an interface and workflow tailored to the specific needs of each service unit.

Identification and Analysis of User Needs

Based on interviews and observations conducted with users of the electronic medical record system at Elisa Clinic, the key issues identified are as follows: (1) patient identity data is incomplete; (2) duplicate patient medical records still exist; (3) patient search functionality is limited, relying on name prefixes; (4) users require a more structured presentation of patient history and information; (5) the system interface needs to be simplified and made more intuitive; and (6) the system occasionally exhibits slow response times during service operations. Given these issues, a redesign of the interface

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is necessary to support user needs and make the medical record service process more effective and efficient.

System Interface Redesign

The design phase involved creating wireframes to establish the basic page layout, which were then developed into interactive prototypes using Figma. This process was directly guided by identified user needs, ensuring that every design improvement addressed specific issues found in the original system. A comparison between the original system interface and the redesigned version for several key modules is presented below.

1. Elisa Clinic system login page: The login page is used for the user authentication process prior to accessing the system.

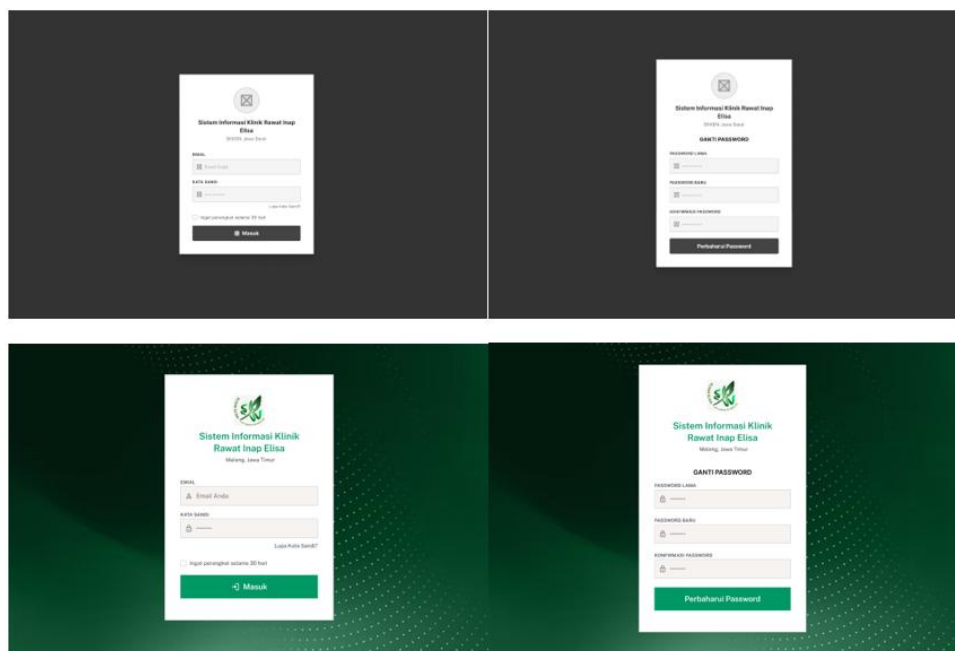


Figure 2. Elisa Clinic System Login Page Display

2. Dashboard Page: The dashboard page displays key information and menus that users can utilize within the system.

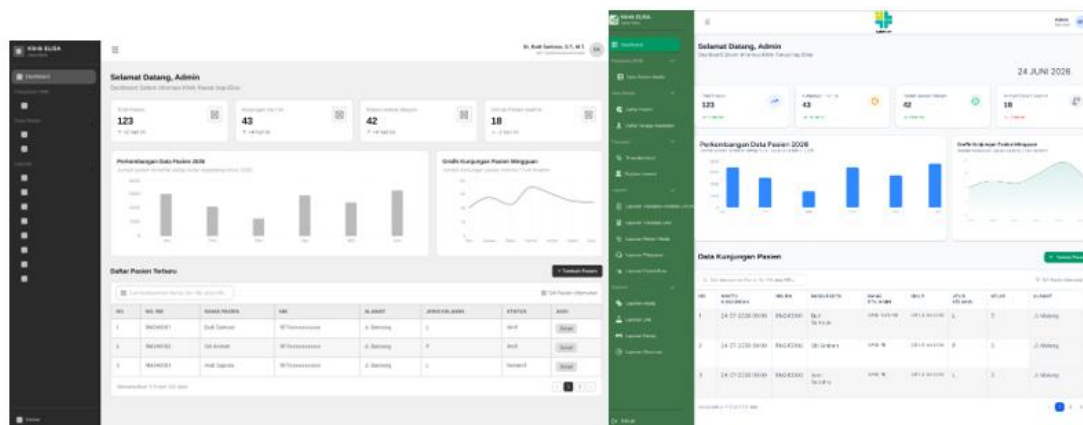


Figure 3. Dashboard Page View

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3. Medical Record Data Page: This page is used to display and manage patient medical record data.

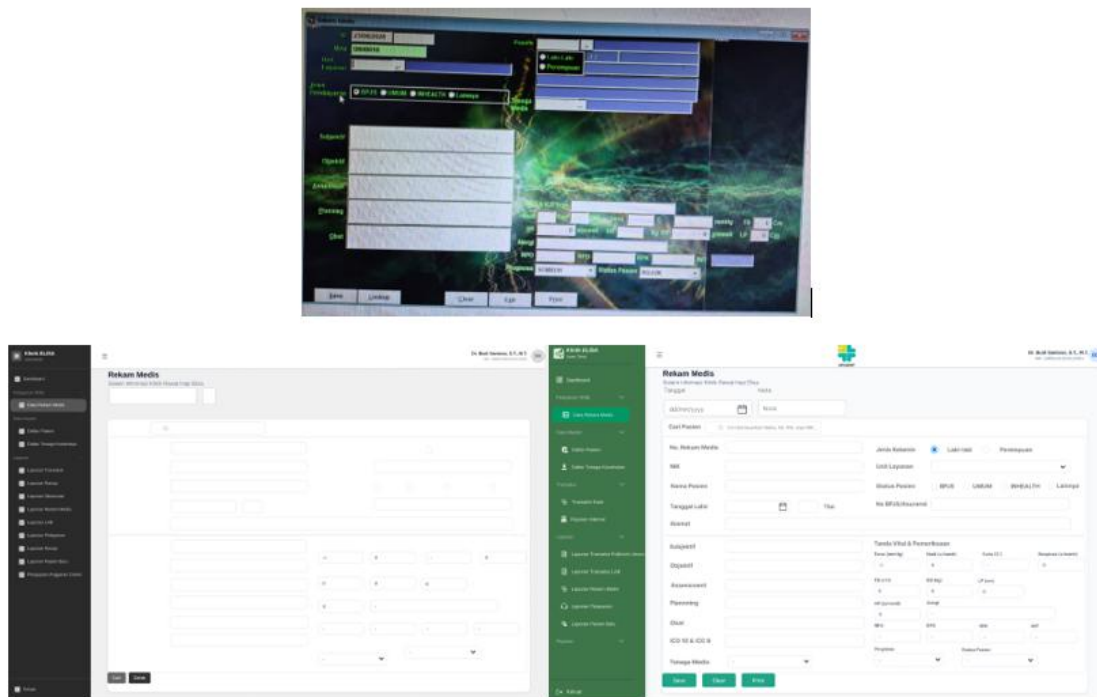


Figure 4. Medical Record Data Page View

4. Patient List Page, Add Patient, and Patient Details: This page is used to manage patient data, ranging from viewing the list and adding data to viewing patient details.

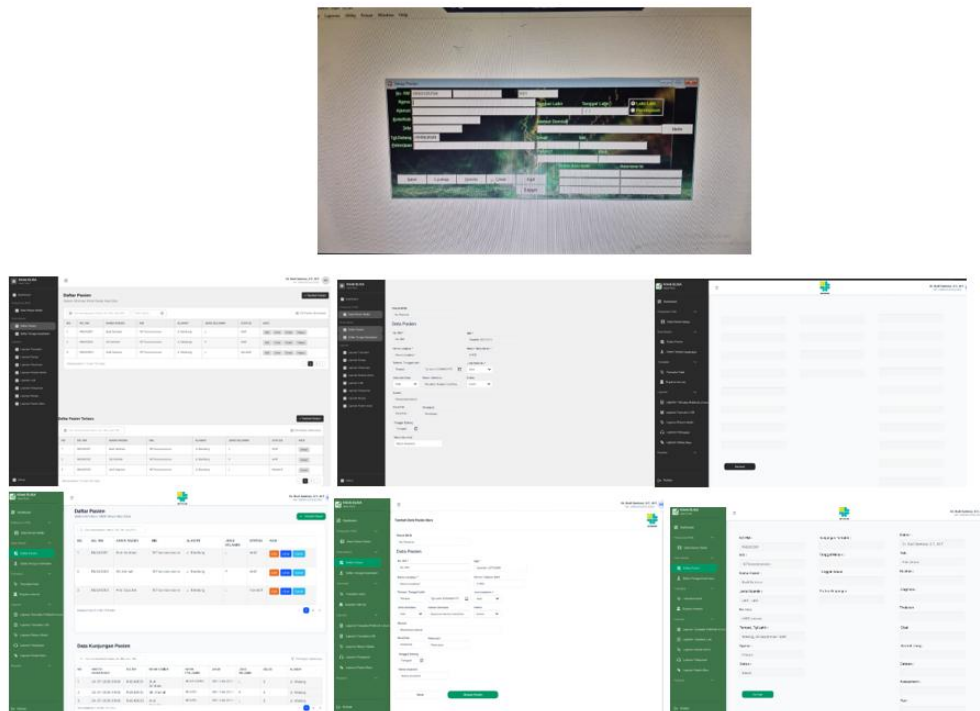


Figure 5. Patient List Page, Add Patient, and Patient Details

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5. Patient search view: Fuzzy matching is a search method that enables a system to locate data resembling the entered keywords, even if the spelling or word order is not an exact match. In the Elisa Clinic system, this feature is used to facilitate more flexible patient data searches based on name.

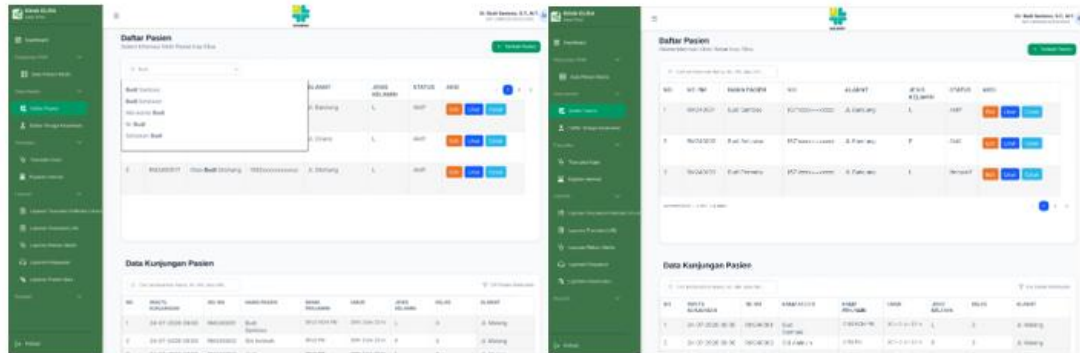


Figure 6. Patient search view

6. Healthcare Professionals List and Add Healthcare Professional pages: This page is used to view and add data on healthcare workers registered in the system.

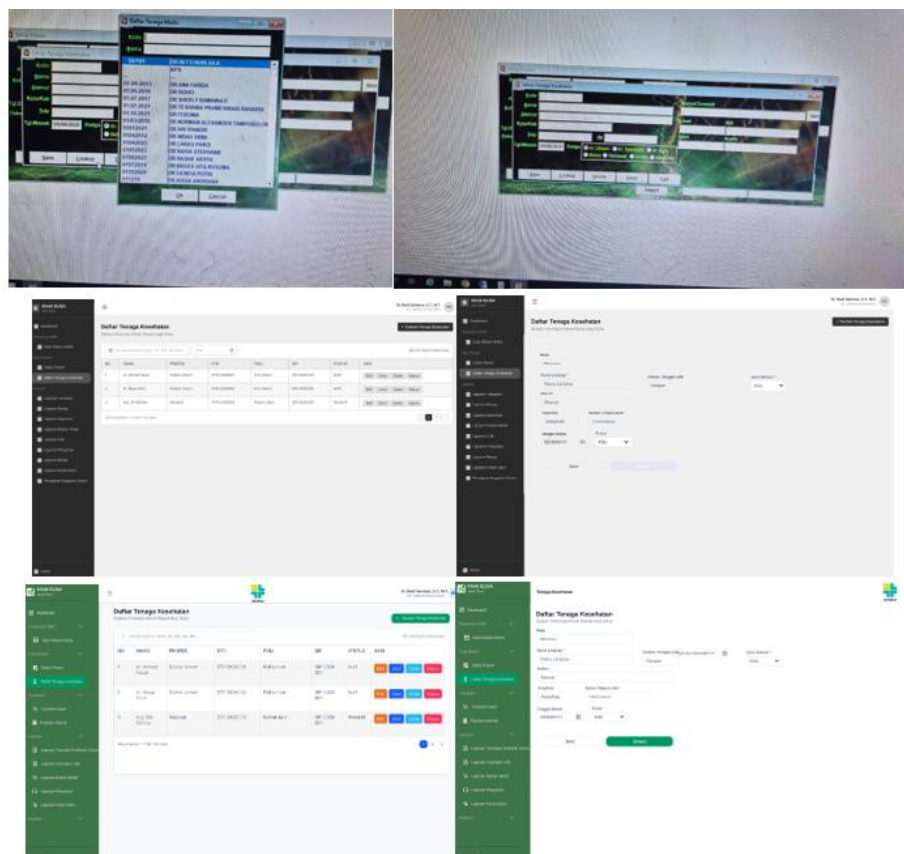


Figure 7. Healthcare Personnel List and Add Healthcare Personnel pages

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7. Medical Record Merging Page: This page is used to merge duplicate patient medical records into a single patient record.

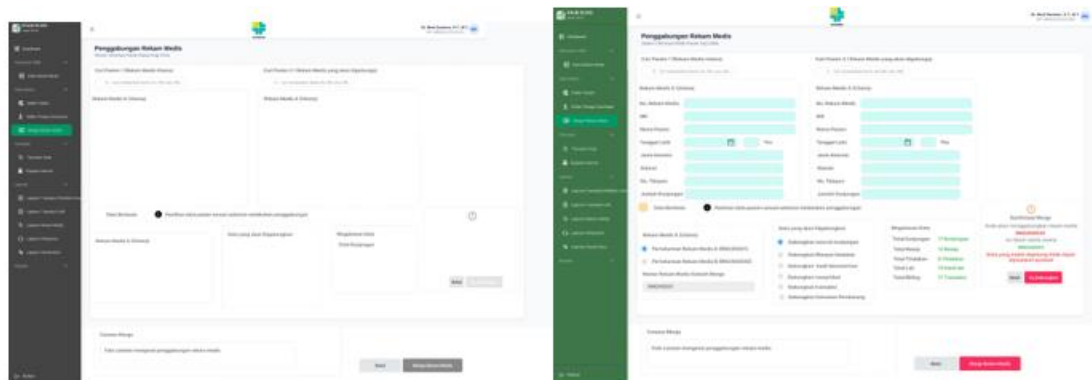


Figure 8. Medical Record Merging Page View

8. Internal Reference Page: This page is used to manage the patient referral process between service units at Elisa Clinic.

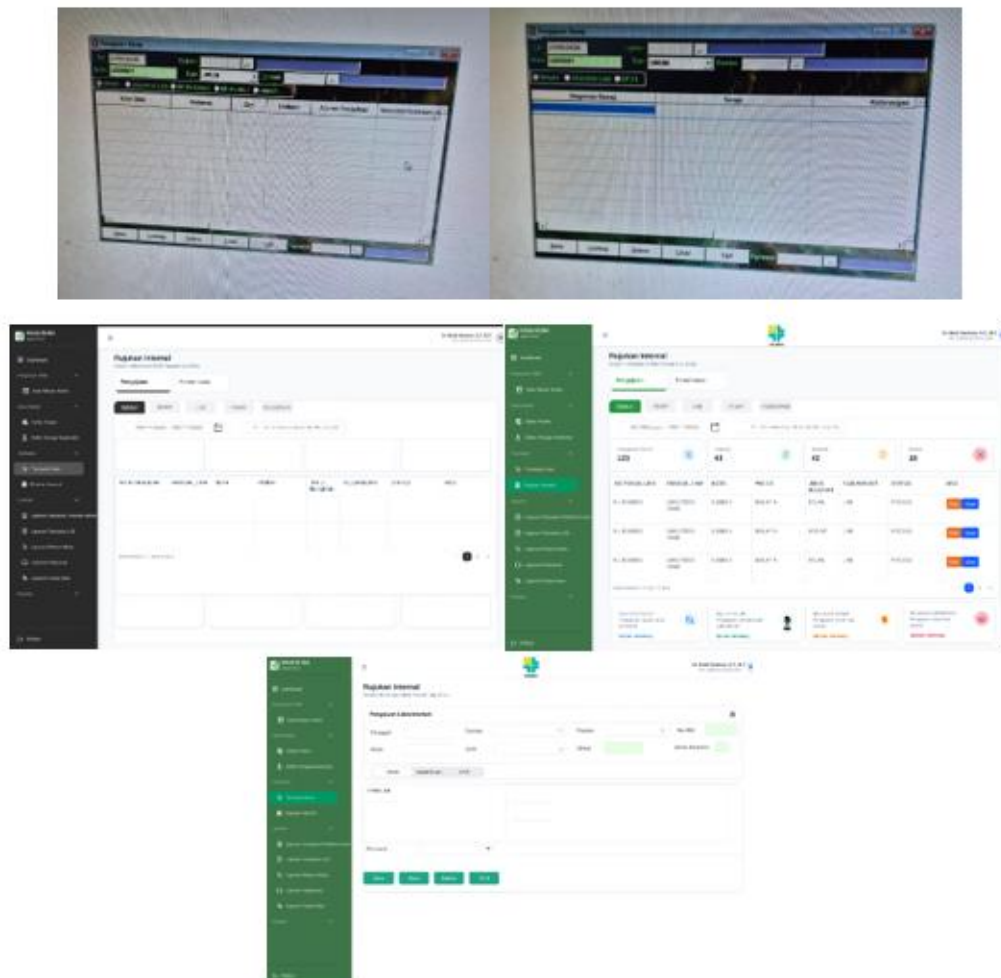


Figure 9. Internal Referral Page View

Interactive Prototype

The design was subsequently developed into an interactive prototype using Figma. The prototype links the login page, dashboard, patient registration, patient search, medical records, procedures, prescriptions, laboratory, pharmacy, cashier, referrals, and reports. It serves as a visualization of the design and a means for initial validation prior to the implementation phase.

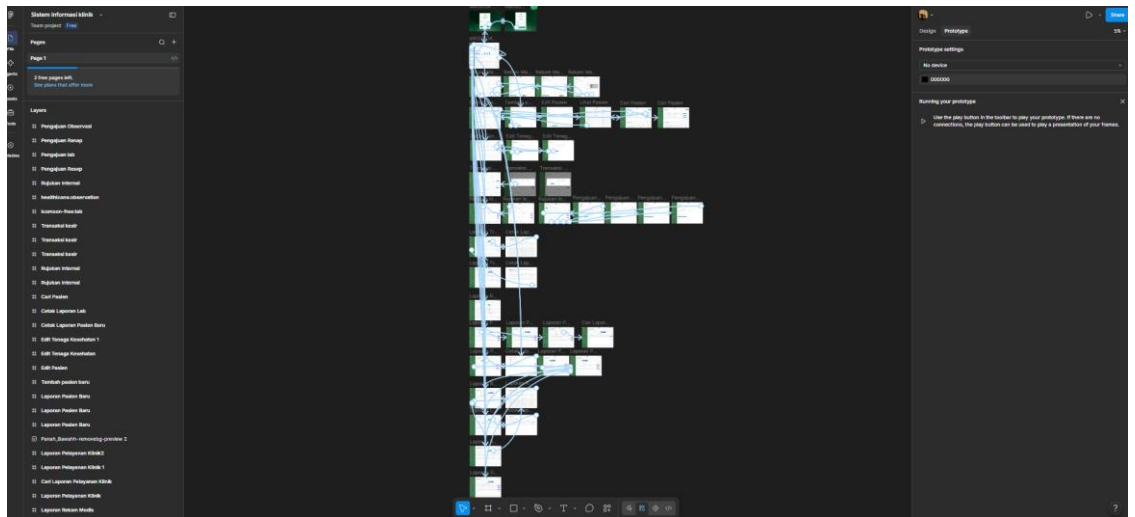


Figure 10. Overall layout of the interactive prototype for the EMR system interface design.

Design Evaluation (System Usability Scale)

The evaluation of the electronic medical record system's interface design was conducted using the System Usability Scale (SUS) method, involving three respondents who are the system's primary users at Elisa Clinic. Each respondent was asked to rate ten statements using a five-point Likert scale: Strongly Disagree (STS), Disagree (TS), Neutral (N), Agree (S), and Strongly Agree (SS). The interpretation of the evaluation results is based on the System Usability Scale (SUS) categories used by Wulansari et al. (2023), namely:

- ≥70–80 : Suitable (good/excellent)
- 60–70 : Marginal/moderate (acceptable but requires improvement)
- <60 : Unsuitable (priority for improvement)

Table 2
System Usability Scale (SUS) Calculation Results

Respondents	Total Score	SUS score	Interpretation
R1	29	72,5	Suitable (good/excellent)
R2	28	70,0	Suitable (good/excellent)
R3	27	67,5	Marginal/moderate
Average	28	70,0	Suitable (good/excellent)

The redesign of the electronic medical record interface at Elisa Clinic was not limited to improving visual appearance, but was directed toward supporting the implementation of a more functional and efficient health information system. The identified user problems, including incomplete patient identity data, duplicate medical

records, limited patient search functionality, unstructured presentation of patient information, and slow system response, indicate that interface design is closely related to the quality of health service processes. Therefore, the proposed redesign was developed to support more accurate patient identification, easier retrieval of medical information, improved continuity of records, and smoother workflows between service units.

From a health system implementation perspective, several redesigned functions have practical implications for service delivery. The patient registration and search functions may help reduce difficulties in locating patient records, while the medical record merging feature is intended to support the management of duplicate records and improve data consistency. The structured presentation of medical record information may also facilitate faster access to relevant patient data during service delivery. In addition, the internal referral feature can support coordination between service units within the clinic. These functions demonstrate that the redesign is not merely an interface modification, but an effort to align the EMR system with clinical and administrative workflows. The interactive prototype also integrates several service components, including patient registration, medical records, procedures, prescriptions, laboratory services, pharmacy, cashier functions, referrals, and reporting. This integration is important because the implementation of an EMR system requires continuity of information across different service processes. A system that reflects actual user workflows has the potential to reduce repeated data entry, improve information accessibility, and support more efficient coordination among healthcare workers. However, because the current study was conducted at the prototype stage, these potential benefits still require further evaluation after the system is implemented in routine clinical practice.

The SUS evaluation provides initial evidence regarding user acceptance of the proposed interface. These results are consistent with the use of the SUS as a simple instrument for measuring user perceptions of usability through ten positive and negative statements (Sembodo et al., 2021; Wulansari et al., 2023). However, usability should be regarded as one component of successful health information system implementation rather than the final outcome. A usable interface may facilitate adoption, but effective EMR implementation also depends on system reliability, data quality, workflow compatibility, user training, technical support, and consistent use by healthcare personnel. Research by Luthfi and Arfiani also demonstrates that SUS evaluations can be used to assess the acceptance of UI/UX designs following the UCD process (Luthfi & Arfiani, 2024). Therefore, the average SUS score of 70.0 should be interpreted as an indication that the prototype was generally acceptable to the participating users and may proceed to further development and implementation testing. Nevertheless, evaluation after implementation remains necessary to determine whether the redesigned system can improve the completeness of patient data, reduce duplicate records, facilitate patient searches, support inter-unit referrals, and increase the efficiency of clinical workflows. Future implementation should also include user training, monitoring of data quality, evaluation of system performance, and periodic feedback from healthcare workers to ensure that the EMR system continues to meet service needs.

Conclusion

The study resulted in a redesigned interface for the Elisa Clinic's Electronic Medical Record (EMR) system using a User-Centered Design approach. User identification involved staff from medical records, registration, medical and nursing teams, the laboratory, the pharmacy, and the referral unit. Needs analysis identified key requirements, including comprehensive patient identification, flexible search capabilities, merging of duplicate medical records, simplified navigation, and a more structured service workflow. The design solution was developed through wireframes, high-fidelity interfaces, and an interactive prototype covering registration, medical record management, patient search, record merging, transactions, referrals, and reporting.

An evaluation using the System Usability Scale with three respondents yielded scores of 72.5, 70.0, and 67.5, with an average score of 70.0, indicating that the design was considered suitable or good based on the study criteria. However, this study was limited to the design and usability evaluation stages and did not assess the actual implementation of the EMR system in routine healthcare services. Therefore, the redesigned interface should be considered a prototype for further development rather than evidence of successful implementation. Future studies should evaluate the system after implementation by assessing its impact on service performance, including registration time, patient search efficiency, duplicate medical record reduction, completeness and accuracy of patient data, workflow efficiency, user satisfaction, and continuity of care. Such service impact evaluation is necessary to determine whether the redesigned EMR system provides measurable improvements in clinical and administrative services at Elisa Clinic..

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