The 1st International Innovation Technology Proceedings
Vol 1 No 1 (2023): October
E-ISSN: 3030-9948
https://iite-proceeding.poltekindonusa.ac.id

Design and Implementation of Nusa Medis for Cloud Computing-Based Electronic Medical Record Systems

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Received:	Revised:	Accepted:	Published:
July 8, 2023	July 15, 2023	July 27, 2023	October 05, 2023

Abstract

The background of this research is the importance of using information technology in health services to increase the efficiency and effectiveness of health services. However, there are still many challenges in implementing electronic medical record systems, such as difficulties in integrating data from various sources, data security issues, and limitations in data accessibility.

The purpose of this research is to design and implement a cloud computing-based electronic medical record system that can meet the special needs of various health care providers and improve the accessibility of patient data safely and efficiently. The method used in this study is a system development approach based on the software development life cycle by combining user-based design principles and feedback from health care providers.

The result of this research is a web-based electronic medical record system that can be accessed from anywhere with an internet connection, with features such as medical history tracking, appointment scheduling, prescription management, and billing management. This system also has a high level of security to protect patient privacy and prevent unauthorized access.

Keywords: *cloud computing*, *electronic medical records, medical nusa medis.*

1. Introduction

On August 31, 2022, the Government through the Minister of Health of the Republic of Indonesia issued Regulation of the Minister of Health Number 24 of 2022 concerning Electronic Medical Records. This regulation itself legally revokes the Regulation of the Minister of Health of the Republic of Indonesia No. 269/MENKES/PER/III/2008 of 2008 concerning Medical Records which of course is no longer relevant to the development of science and technology that is developing. very rapidly, especially in terms of the development of digital technology which enables the transformation of the digitalization of health services, including in the case of electronic medical records which must prioritize the principles of security and confidentiality of data and information. With the issuance of this new regulation, health facilities are immediately burdened with the obligation to be able to organize RME in accordance with these regulations, based on these regulations, health facilities including independent practice are given until December 31, 2023 to be

able to implement it. If the health facility or health service cannot implement it, an administrative sanction will be imposed (written warning and/or recommendation for revocation or revocation of accreditation status) against the health service facility that commits a violation. Of course this is done to be able to realize legal certainty. However, it cannot be denied that there are many challenges that must be overcome by health services to be able to implement this, especially for health services in remote areas of Indonesia which do not have access to adequate internet and computer networks. In a study conducted by several researcher previously found several obstacles in the implementation of Electronic Medical Records including human resources (HR), policies and regulations, infrastructure and costs, and most importantly how Electronic Medical Records (RME) can support every need for service activities in health facilities [1]–[7]. The role of information systems in health facility management activities is very helpful and plays a very effective role in the process of health services, with an information system a leader of a health facility can make a policy quickly, precisely and accurately based on information obtained from health services in the health facility led [1], [2], [4], [6]–[10].

The solution offered to overcome the above problems is a free and reliable Cloud Computing-based RME information system according to the criteria of government regulations regarding PMK No. 24 of 2022 and regulations related to decisions related to Guidelines for Variables and Meta Data in the Implementation of Electronic Medical Records which are attached to the Decree of the Minister of Health (Kepmenkes) Number HK.01.07/MENKES/1423/2022. Updating and developing the Nusa Medis application will always be carried out to comply with applicable regulations, this application can even be customized according to user needs, this application can be run as a local client server or on cloud computing for easy access using either a Laptop/PC/Android.

2. Materials and methods

The type of research used in this research is qualitative research with action research methods. Whereas method development system using waterfall, where method This Lots interested developer system Because for convenience [11]–[13], [13], [14], the action research method has 4 stages, including problem identification, action planning, action implementation and action evaluation.

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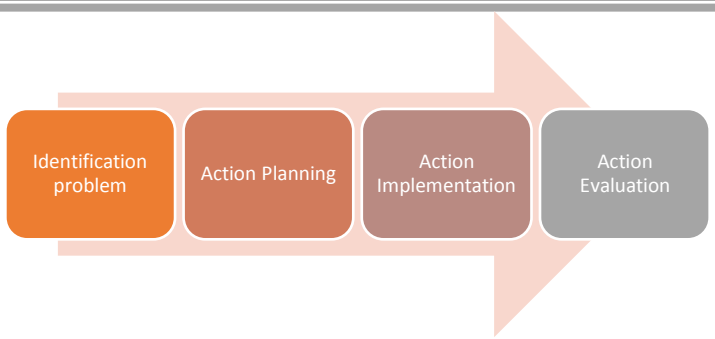

Figure 1. Action Research Methods

From Figure 1 above, in outline to fulfill the research stages by:

1. Identify user needs analysis.
2. Define users using electronic medical records.
3. Designing cloud computing-based electronic medical records.
4. Electronic medical record test using Blackbox Testing [13], [13]–[20].

The inclusion criteria for research subjects in this study were subjects who understood electronic medical records. While the exclusion criteria for research subjects in this study were subjects who did not understand electronic medical records.

Based on the consideration of these inclusion criteria, table 1 shows that the research subjects in this study were lecturers at the Indonusa Surakarta Polytechnic, system development partners and health information management students.

Table 1. Number of Research Subjects

NO.	Research Subjects	Total
1.	Teacher	7
2.	System development partner	6
3.	Student	14
	Total	27

3. Results and Discussion

a. Identify user needs analysis.

Table 2. Needs Analysis

NO	Module	Information
1.	Registration	Patient ID like • Name • Place of birth • Date of birth • Gender • Religion • Allergy medicine • Blood type

NO	Module	Information
		• Rhesus • KTP / Identity No • Ward • Address • Phone number • Education • Work • Nationality • Marital status
2.	Treatment Road	Subjective: Anamnesis Objective : • General condition of the patient • Systolic Blood Pressure • Diastolic Blood Pressure • pulse • Breathing • Temperature • Weight • Height Assessment: Diagnosis Planning : • Action • executor • BHP • Therapy • Mixed Therapy Transfer Lab Results Radiology Results Sale
3.	Drugstore	• General Sales • Guarantee Sales • Free Sales • Sales Returns • Reprint Sales Records • Reprint E-Tickets • Reprint Return Notes • Drug Preparation Process • LCD Pharmacy
4.	Medical records	• Patient Data • ICD 9 Teacher • ICD 10 Teacher • Input Diagnostics
5.	BPJS	Pcare logs
6.	Cashier	• Patient Payments • Guarantee Patient Payments • Receipt Reprint
7.	Management	Configuration • Configuration • Tariff Configuration

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NO	Module	Information
		• Service Configuration User • Employee Management • Organizational structure • Position • User Login • Change Password Rates • Registration fee • Inspection fees • Action Rates Medical • Set Poly • Doctor's Schedule • Education Teacher • Job Teacher • ICD category • Main Diagnostics • Master Procedure Import • Import Officer • Patient Import
8.	Admin	• User Login • Change Password

b. Define users using electronic medical records.

Table 3. User Context

NO.	User	Information
1.	Officer Registration	Perform patient registration and confirm the number of patients (visit)
2.	Nurse	Assists in filling subjective and objective (Vital Sign)
3.	Doctor	Conducting examinations (Assessmen) and prescribing drugs (Planning)
4.	Pharmacist	acquisition of drugs and monitoring of drug sales reports
5.	Cashier Officer	Completing payment/bills for patient examinations

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c. Designing cloud computing-based electronic medical records.

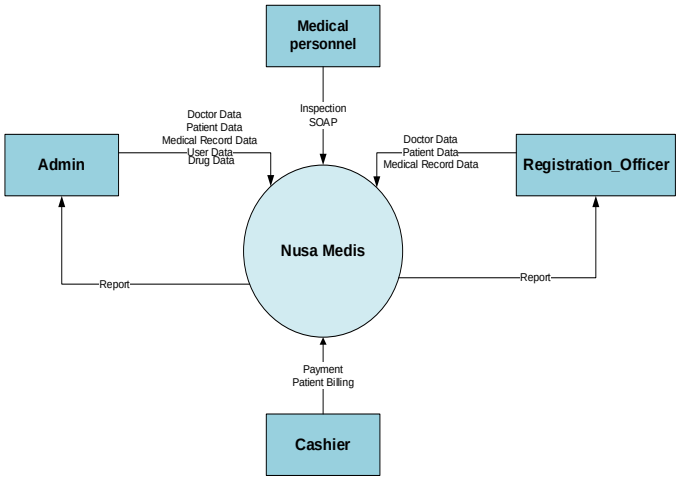

Figure 2. Context Diagram

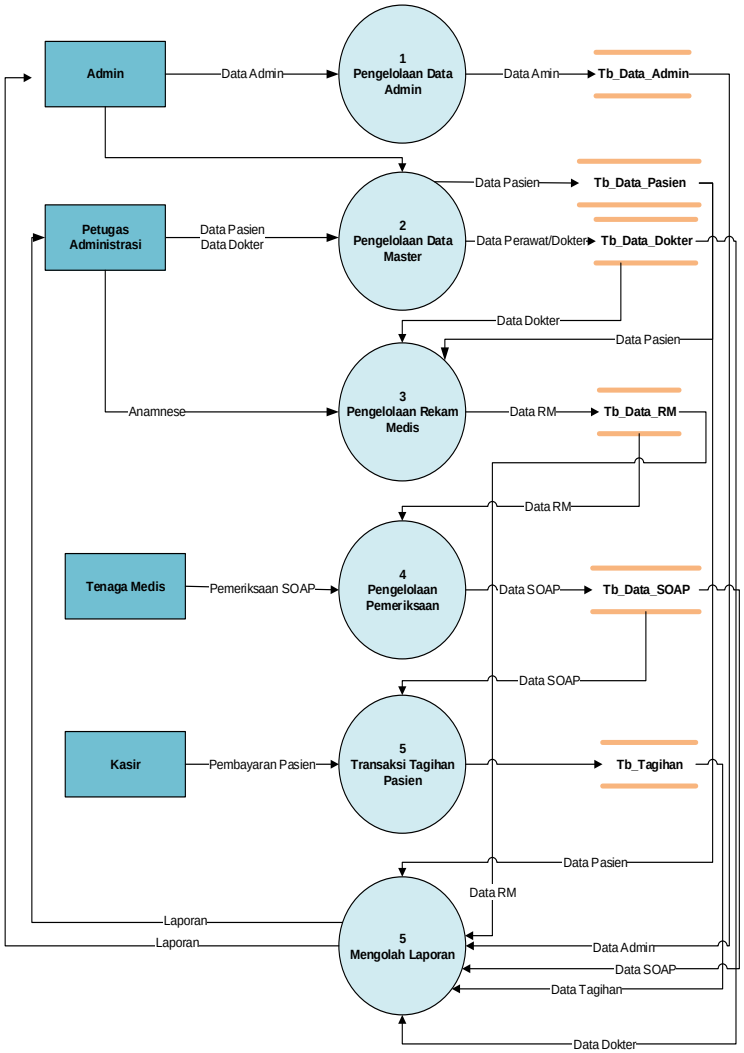

Figure 3. Data Flow Diagram

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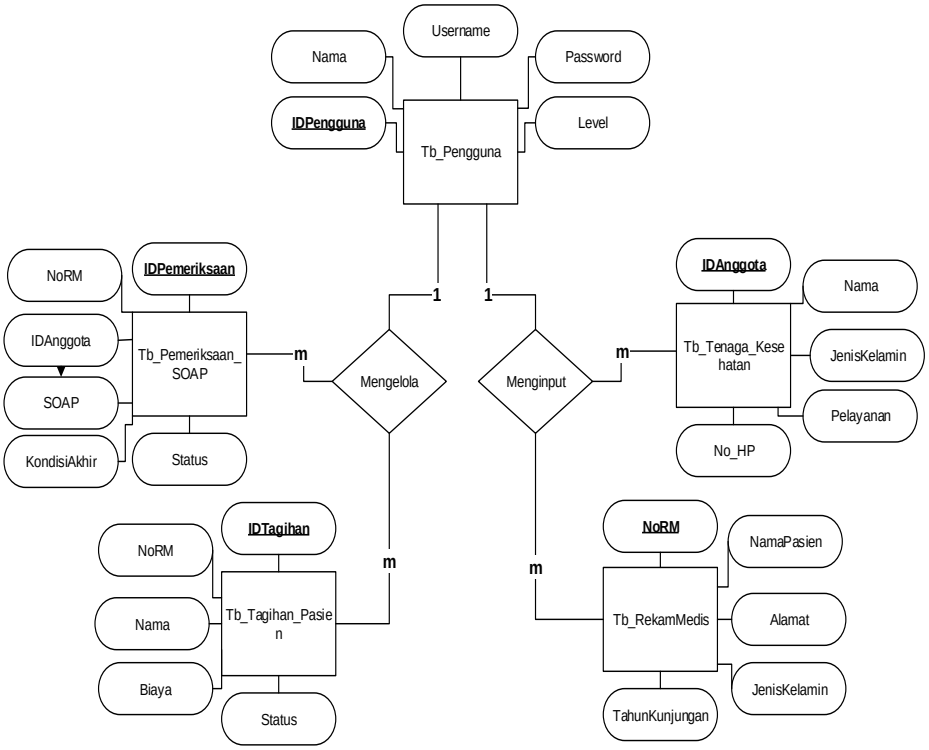

Figure 4. Entity Relationship Diagram

Figure 5 Login Display

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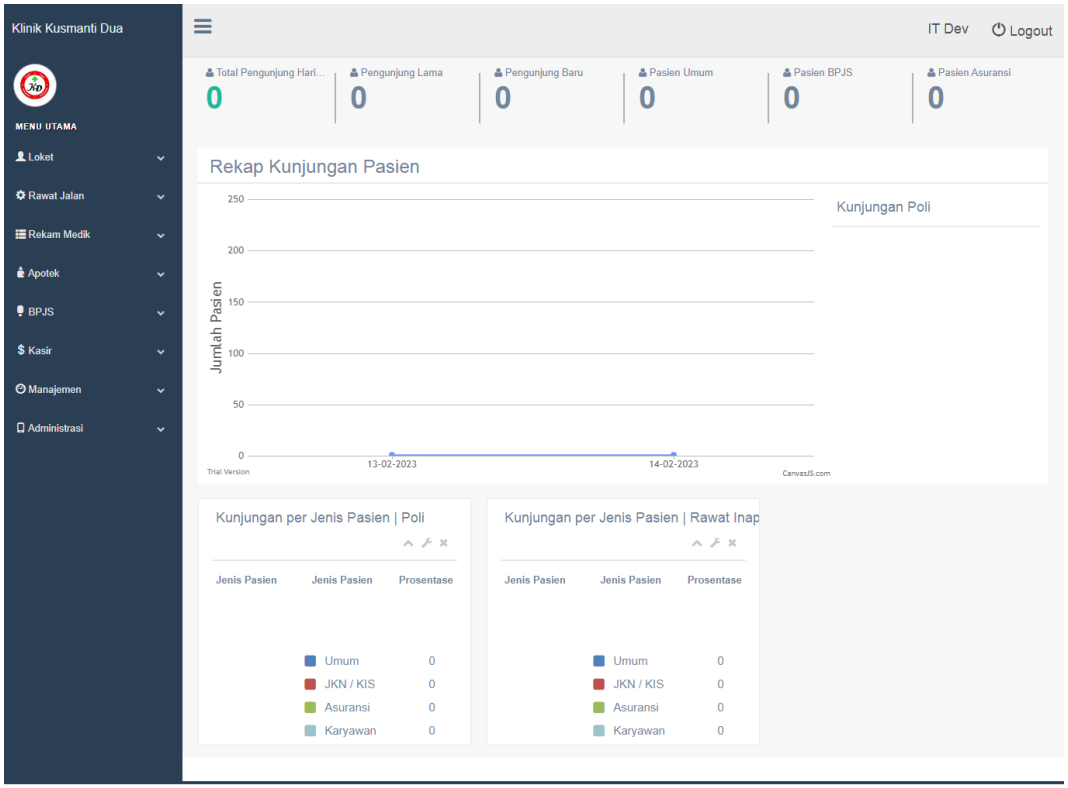

Figure 6. Display Dashboard

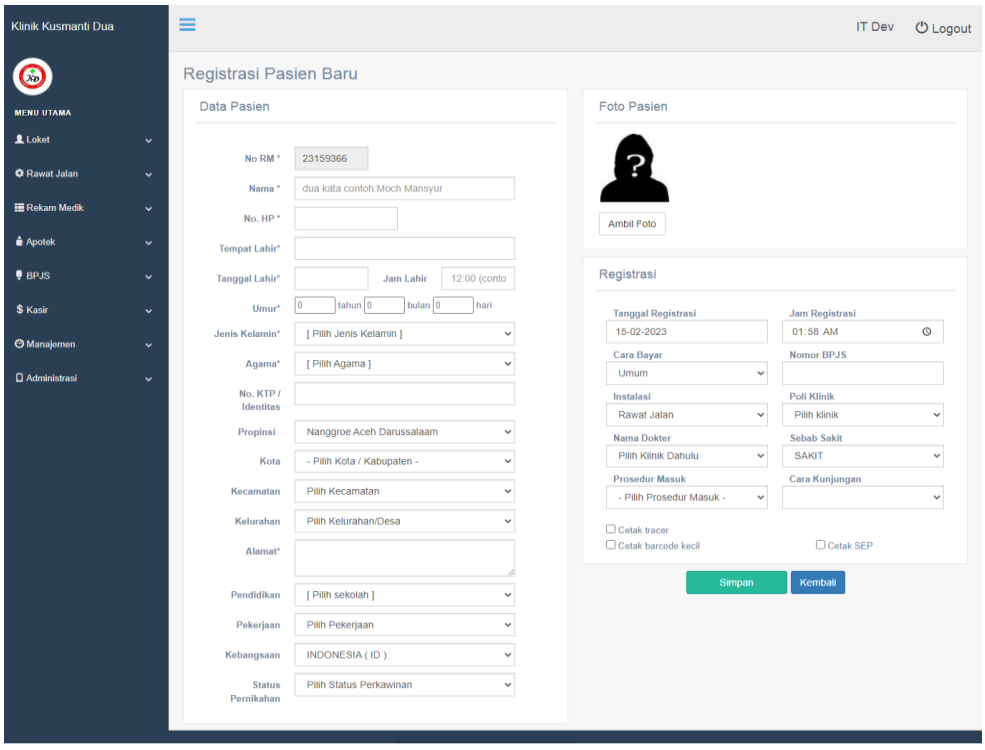

Figure 7. Display of Patient Registration

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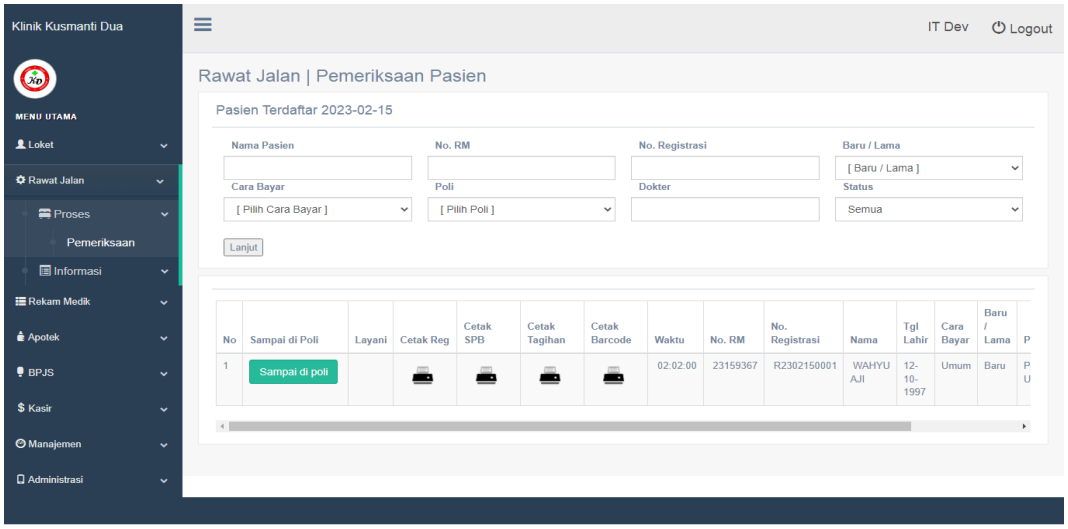

Figure 8. Outpatient view

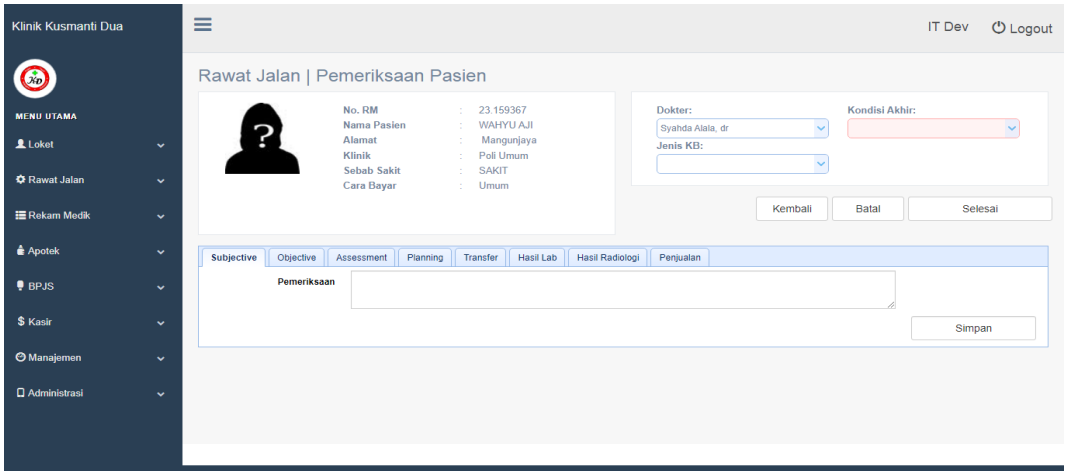

Figure 9. Display of General Poly Electronic Forms

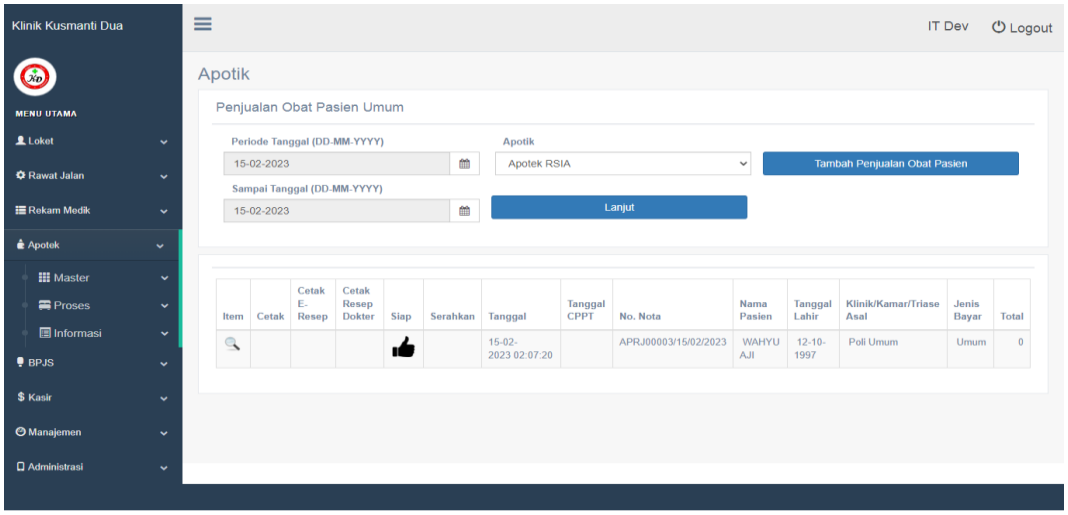

Figure 10. Display Pharmacy

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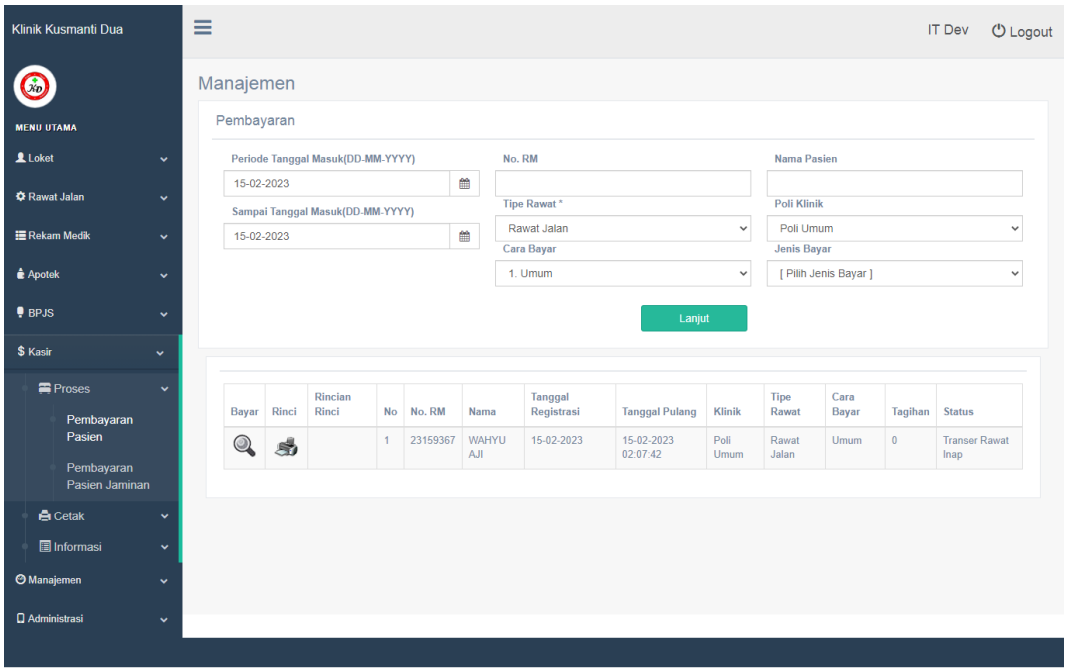

Figure 11. Display Cashier

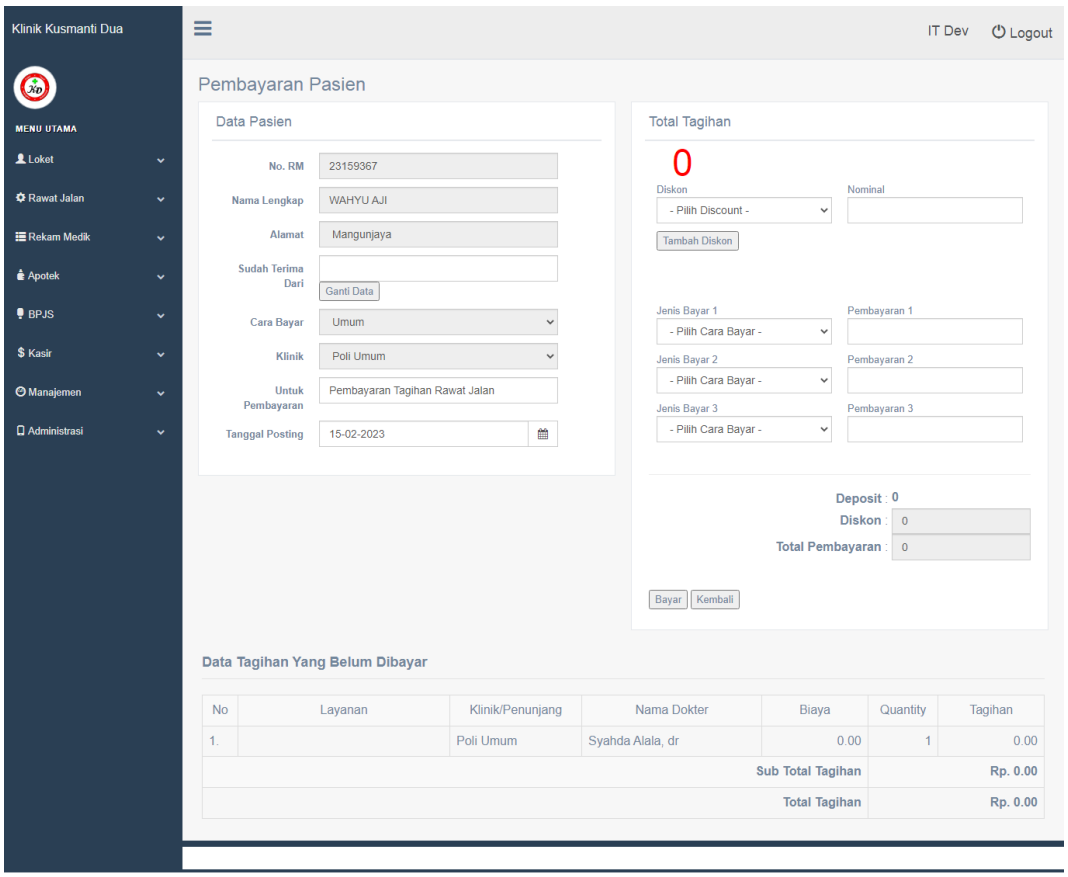

Figure 12. Patient Billing Form

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d. Electronic medical record test using Blackbox Testing

Table 4. Testing Table on the User page Registration

NO	Functionality	Test Scenario	Expected results	Conclusion
1.	The registrar can log in	Fill out the *login form* containing username and *password*	Nusa Medis Dashboard display	√
2.	Registration officers can add patient data	Click the counter menu, patient registration	Displays patient identification data	√
3.	Registration officers can display reports	Select the information menu, reports	The patient visit report page appears	√
4.	The registration officer can *logout*	Select the *logout menu*	*login* page appears	√

Table 5. Testing Table on the User page Nurse

NO	Functionality	Test Scenario	Expected results	Conclusion
1.	Nurses can log in	Fill out the *login form* containing username and *password*	NusaMedis Dashboard display	√
2.	Nurses can fill out both subjective and objective forms	Click the outpatient menu, examination	Displays subjective and objective forms	√
3.	Nurse can *logout*	Select the *logout menu*	*login* page appears	√

Table 6. Testing Table on the User page Doctor

NO	Functionality	Test Scenario	Expected results	Conclusion
1.	Doctors can log in	Fill out the *login form* containing username and *password*	NusaMedis Dashboard display	√
2.	I can fill in the doctor through the assessment and planning forms and the final condition of px.	Click the outpatient menu, examination	Displays assessment and planning forms	√
3.	Doctors can *logout*	Select the *logout menu*	*login* page appears	√

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Table 7. Testing Table on the User page Pharmacist

NO	Functionality	Test Scenario	Expected results	Conclusion
1.	Pharmacists can login	Fill out the *login form* containing username and *password*	NusaMedis Dashboard display	√
2.	Pharmacists are able to prepare medicine	Click the pharmacy menu, process	Shows the process of preparing and administering medication	√
3.	Pharmacists are able to monitor medication	Click the pharmacy menu, information	Displays the drug sales report form	√
4.	Pharmacists can *Logout*	Select the *logout menu*	*login* page appears	√

Table 8. Testing Table on the User page Cashier Officer

NO	Functionality	Test Scenario	Expected results	Conclusion
1.	The cashier can log in	Fill out the *login form* containing username and *password*	NusaMedis Dashboard display	√
2.	The cashier is able to settle patient bills	Click the cashier menu, process	Displays the patient payment form	√
3.	The cashier can *logout*	Select the *logout menu*	*login* page appears	√

4. Conclusion

From the method used using SDLC The results of this study are a cloud- based electronic medical record system that can be accessed from anywhere with an internet connection, with features such as tracking medical history, scheduling appointments, prescription management, and billing management. This system also has a high level of security to protect patient privacy and prevent unauthorized access. RME Nusa Medis tested its accuracy using the blackbox method from 24 respondents, consisting of lecturers, development partners, and students based on functionality and average success results in accordance function.

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