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Design of a Website-Based Medical Record Information System with QR Code for Fast Data Access: A Case at Dr. Radi Yarman's General Practice

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Abstract

Medical record data management at Dr. Radi Yarman's General Practice is currently still conducted manually using registration books and physical archives. This leads to several constraints, such as slow retrieval of patient medical history, risks of data loss or damage, and a lack of efficiency in patient services. This study aims to design and develop a website-based medical record information system integrated with QR Code technology to accelerate patient data access. The system development method used is the Waterfall model, which includes requirements analysis, system design, implementation, testing, and maintenance. The system design is modeled using Unified Modeling Language (UML) and Entity Relationship Diagram (ERD), while the implementation uses PHP programming language and MySQL database. The results show that the developed system is capable of digitalizing the medical recording process, storing data centrally, and accelerating patient identification through QR Code scanning. System testing was conducted using the Black Box Testing method to ensure functional features run as planned, as well as Usability Testing to assess ease of use. With this system, the doctor can manage patient visit history, diagnoses, and prescriptions more quickly, accurately, and securely, thereby improving the quality of health services at Dr. Radi Yarman's General Practice.

Keywords: Information Systems, Medical Records, Website, QR Code, Waterfall.

1. Introduction

In today's digital era, the use of information technology in the health sector is becoming an increasingly important need [1]. One of the crucial aspects is the efficient, fast, and secure management of patient medical record data. Medical practices that still rely on manual recording or local file systems face many challenges, such as the risk of data loss, delays in information retrieval, and lack of integration between devices[2], [3]. Therefore, an integrated website-based information system is needed and can be accessed quickly by medical personnel, especially in private practices such as at dr. Radi Yarman's practice.

General Practice dr. Radi Yarman has been established since 2018, located in a remote village in Kecematan Lembah Masurai, Merangin Regency, Jambi Province. The practice is one of the primary health facilities that every day serves many patients with various complaints. In the process of serving, doctors need quick access to the patient's visit history, previous diagnosis, and prescription records[4]. However, the manual recording system that is still in place today makes the process of searching for patient data difficult, especially for patients who often receive treatment for a long period of time[5]. To deal with this problem, a web-based information system is needed that is able to store and display medical record data digitally and organized. This site will make it easier for doctors to access patient information faster, more accurately, and more securely. In addition, the application of QR Code technology was added so that each patient has a unique identity in the form of a QR code, which can be scanned to access patient data directly without the need to manually search through a long list.

The use of QR Code technology in medical record information systems offers a practical solution to accelerate direct patient data access[6]. QR Codes allow doctors or medical personnel to scan a unique code containing a patient's link or identity data, thus opening medical records instantly through mobile devices or computers[7]. This is especially helpful in emergency situations as well as daily services as it reduces administration time and improves data accuracy. The use of QR Code technology can speed up the process of entering patient medical

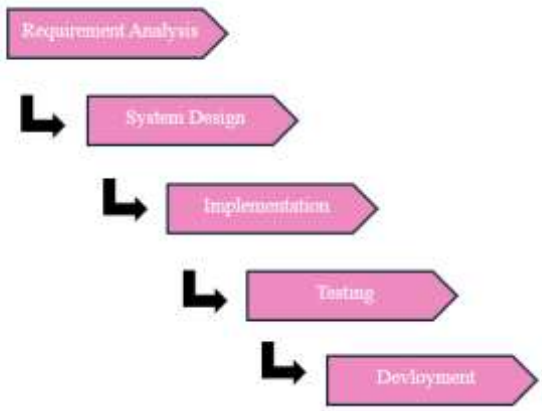
record data, reduce the potential for errors, and increase the accuracy and completeness of documentation efficiently and on time (Amelia dkk., 2023).

In addition, a website-based information system provides an advantage in terms of flexibility and accessibility. Data can be stored centrally and accessed from a variety of devices and locations, with security guarantees that can be developed through a data login and encryption system. This system also facilitates the process of backing up and maintaining medical record data on a regular basis. According to Kementerian Kesehatan Republik Indonesia (2023), Digitization of health data is a strategic step in building a more quality, fast, and equitable health service system throughout Indonesia[9]. This indicates that a digital system like this is not only a local need, but also part of a national policy towards more modern health services[10].

Taking into account the needs in the field and the support of national policies, it is necessary to design a website-based medical record information system with QR Code integration to support the efficiency of medical services in private practices such as dr. Radi Yarman using the waterfall method, because this method has structured and systematic stages ranging from needs analysis, design, implementation, testing to maintenance, thus minimizing errors and facilitating documentation. The scope of the system designed is limited only to outpatient services, considering that dr. Radi Yarman's practice is a private practice service that does not provide inpatient facilities. Therefore, the features developed are focused on managing patient data, recording examinations, visit history, medication prescriptions, and storing digital outpatient medical records. The waterfall method is a sequential software development model, where each stage must be completed first before moving on to the next, so that the workflow becomes more organized and well-planned (Amelia dkk., 2023).

2. Research Methods

This research uses a software engineering *research approach* with a qualitative descriptive method. This approach was chosen because the research aims to design and develop a web-based medical record information system by deeply understanding the conditions and needs of users in the field as the basis for system development[12]. The research was carried out at the General Practice of dr. Radi Yarman, Lembah Masurai District, Merangin Regency, Jambi Province, in the period from September 2025 to February 2026. Data collection is carried out in three stages in order to obtain optimal results, namely: observation, wawamcara, and literature study.



Gambar 1. Waterfall

The development of the system uses *the Waterfall* model which is sequential and systematic. The stages passed include: (1) *Requirement Analysis*, which is the identification of system needs based on the results of observations and interviews; (2) *System Design*, namely database design, user interface, and system modeling using UML which includes *use case diagrams*, *activity diagrams*, and *class* diagrams, as well as ERD to model database relationship structures; (3) *Implementation*, which is the construction of a system using the PHP programming language with MySQL as a database management system; (4) *Testing*, which is testing the functionality of the system; and (5) *Deployment*, which is the implementation of the system on local and online servers[13].

The evaluation of the system is carried out through two test methods. First, *Black Box Testing*, which is used to verify the suitability of each system function to the requirements that have been set, including the input process, data processing, and system output. Second, *Usability Testing*, which aims to measure the level of effectiveness,

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efficiency, and user satisfaction in operating the system, especially in the login feature, patient data recording, medical history search, and medical record reporting.

2.1 Research Stage

To compile this research, a clear framework is needed, which includes the various stages needed to solve the problem being studied. The implemented research framework is shown in figure 2. The following :

Gambar 2. Waterfall

2.2 Running System Analysis

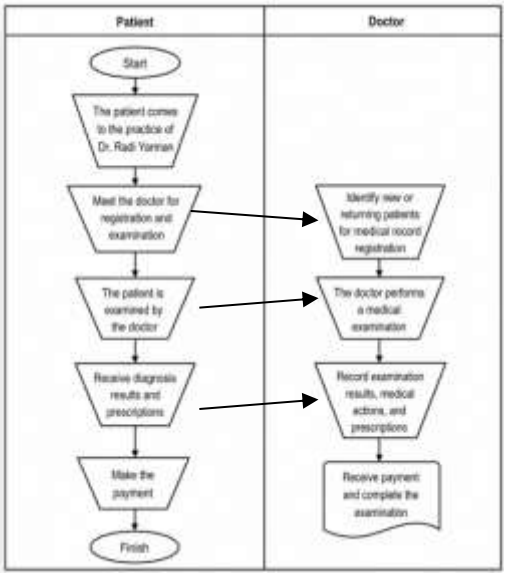

Figure 2. Running System Analysis

2.3 Proposed System Design

A needs analysis was carried out to identify the system specifications as the basis for designing a web-based medical record information system in the General Practice of dr. Radi Yarman. This system is designed to serve two user roles, namely admin and doctor, with functions tailored to their respective needs.

In terms of functional needs, admins have the authority to manage patient identity data, print QR Codes as patient digital identities, manage financial statements, and authenticate in and out of the system. Meanwhile, doctors can scan the patient's QR Code to quickly access the data, view the visit history, record the results of the examination that includes diagnosis, actions, and medication prescriptions, and store and update medical record data.

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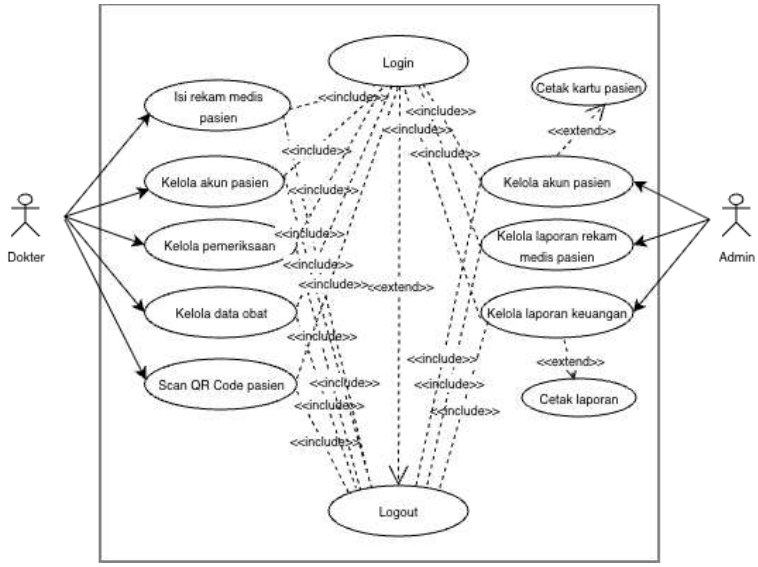
In terms of non-functional needs, the system is designed to meet a number of quality standards, including authentication-based access security, an intuitive and easy-to-use interface without special training, fast data processing performance, system reliability during operating hours, data storage accuracy, data protection from loss or damage, scalability to data growth, compatibility with common web browsers, and ease of maintenance and development of the system in future.

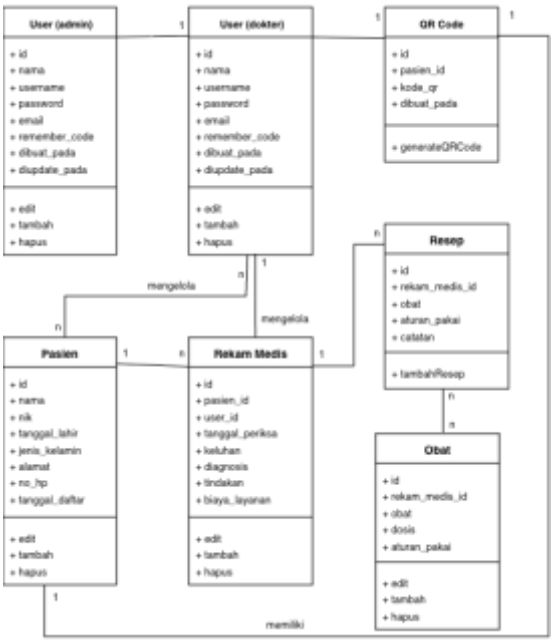
2.3.1 Use Case Diagram



Gambar 3 ***Use Case Diagram***

2.3.2 Class Diagram

The researcher designed a class diagram to help understand the structure and relationships in the system to simplify the process of developing and maintaining the system[14]. The following is an overview of the class diagrams that the researcher designed to be used in the system to be created:



Gambar 4 *Class* Diagram

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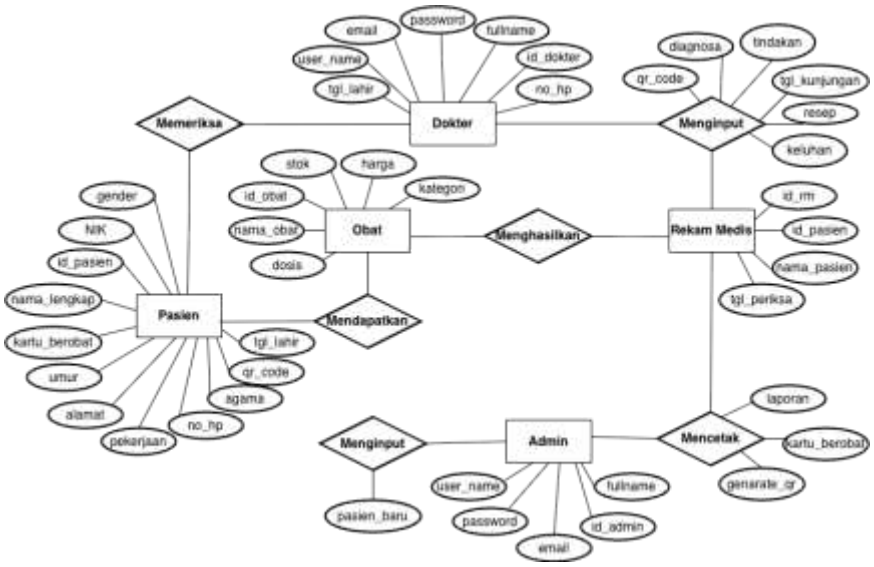
3. Results and Discussions

3.1 Database Design

Entity Relationship Diagram (ERD) is designed to describe the database structure and interconnectedness between entities in the system, including patient, physician, visit, medical records, prescriptions, medications, and disease history[15], [16]. This ERD is the main reference in ensuring that data storage takes place in a structured, integrated, and consistent manner according to system needs, as shown in Figure 6.



Gambar 5. Entity Relationship Diagram (ERD)

3.2 Implementation and Testing

The purpose of this system implementation and testing stage is to ensure that the developed system is able to run according to user needs, function optimally, and is ready to be implemented in poor conditions[17]. Implementation is carried out by applying a system to the operations of dr. Radi Yarman's General Practice so that the process of recording medical records, managing patient data, and making financial reports can run in a more integrated, efficient, and accurate manner. Meanwhile, system testing is carried out to ensure and validate the quality of the software that has been built.

3.3 Interface Implementation

The system interface design consists of several main pages, each of which has a specific function. The login page serves as a user authentication gateway based on username and password, while the registration page facilitates the creation of new user accounts. After successfully logging in, users are directed to a dashboard page that presents a summary of information and navigation to all system features.

On the patient management side, there is a new patient input page for recording patient identities, treatment cards as the patient's physical identity printed from the system, as well as a QR Code scan feature that allows automatic identification of patients without manual search. The medical service process is facilitated through the medical record input page to record complaints, diagnoses, and actions, as well as the medical record history page to display previous examination data.

The system is also equipped with supporting features in the form of drug stock and drug input pages for drug availability management, account management pages for user management, and financial report pages for systematic monitoring of practice income and expenditure data.

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3.3.1 Login View

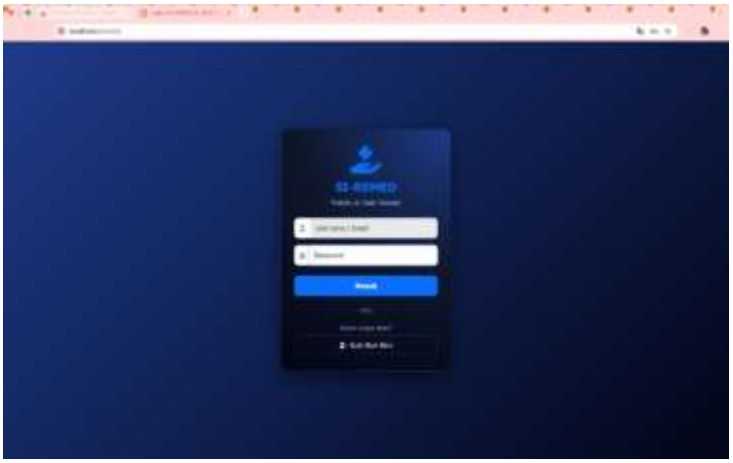

Figure 7. Login View

3.3.2 Account Registration

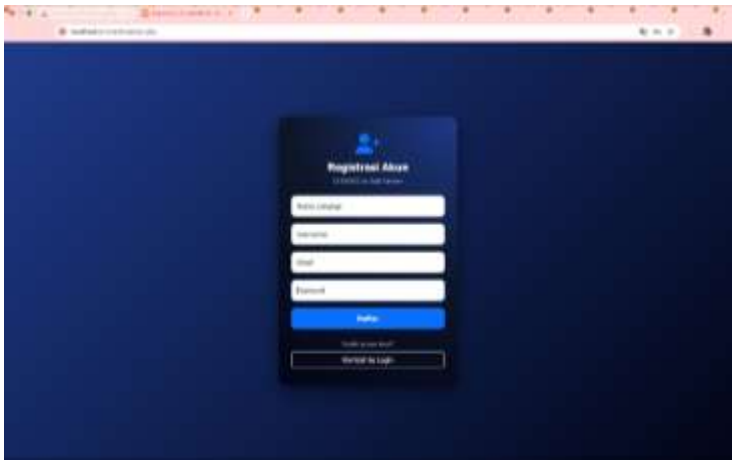

Figure 8. Akum Registration

3.3.3 Dashboard

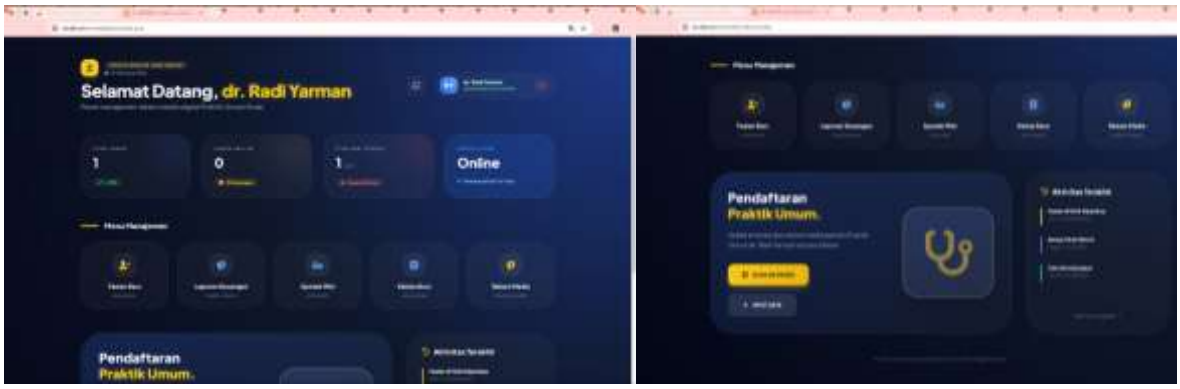

Figure 9. Dashboard

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3.3.4 Patient Input

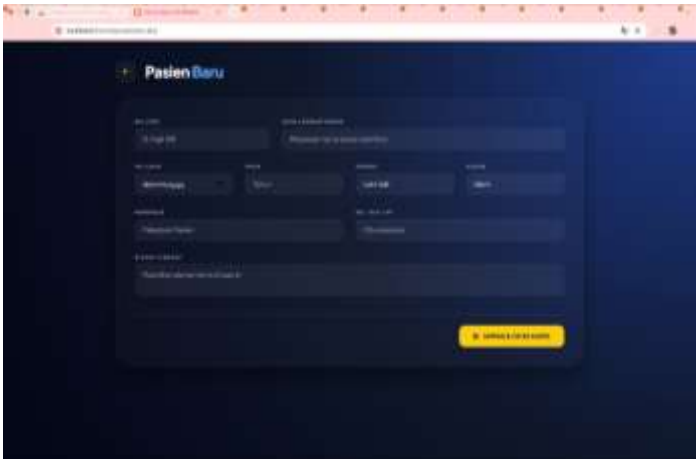

Figure 9. Patient Input

3.3.5 Print the Medicare Card

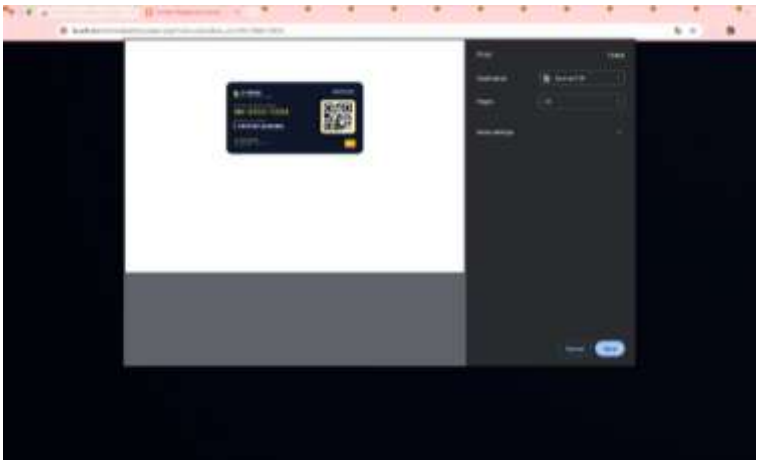

Image. 10 Print Treatment Card

3.3.6 Scan QR Code

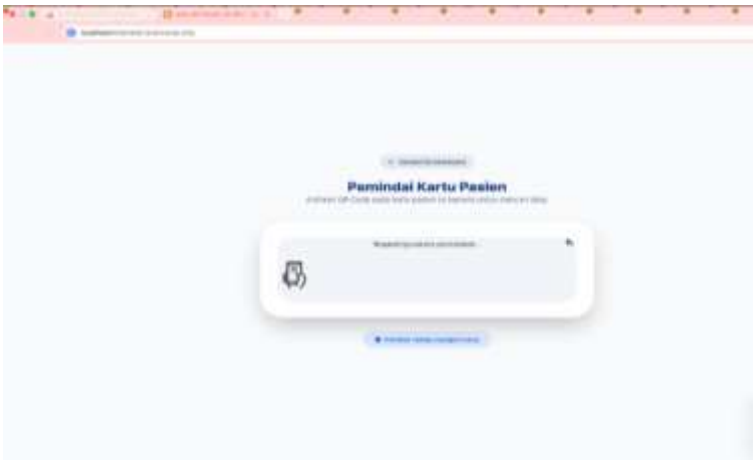

Figure 11. Scan QR Code

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3.3.7 Medical Record Input

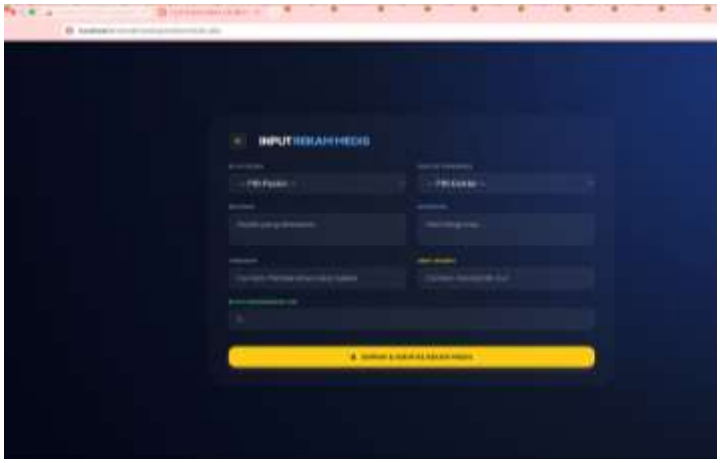

Figure 12. Medical Record Input

3.3.8 Medical Record Records

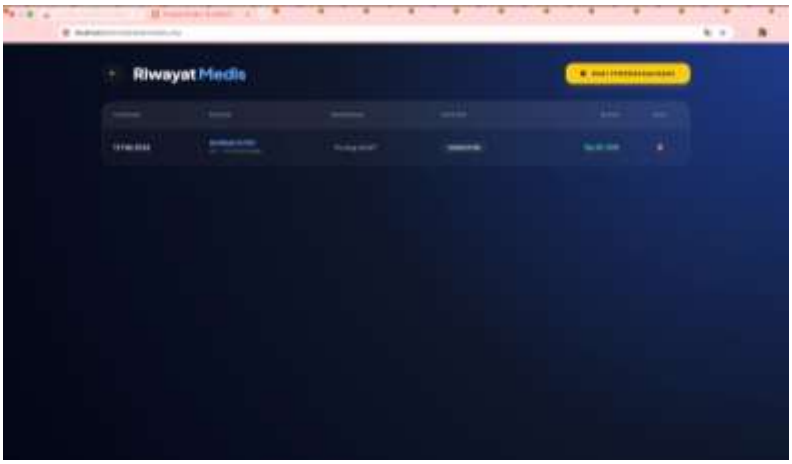

Figure 13. Medical Record History

3.3.9 Drug Stock

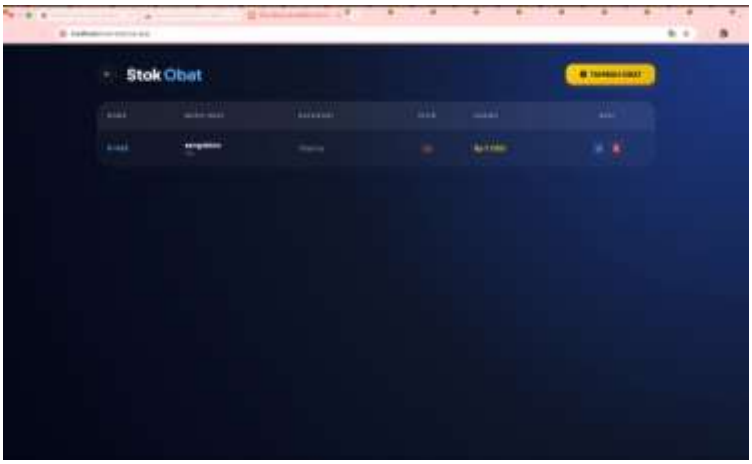

Figure 14. Drug Stock

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3.3.10 Drug Input

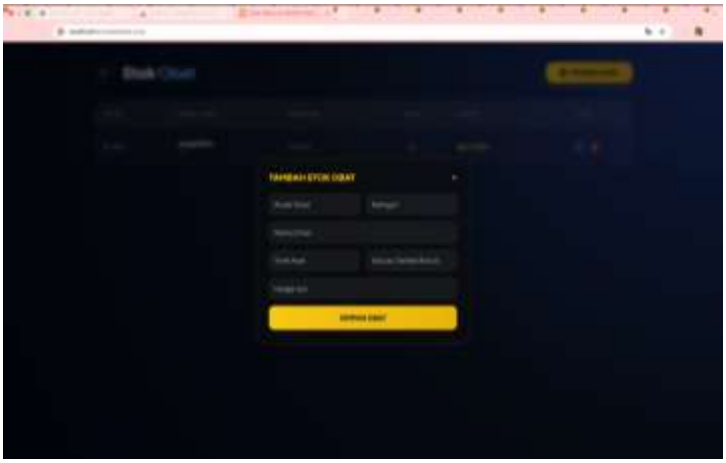

Figure 15. Drug Input

3.3.11 Manage Accounts

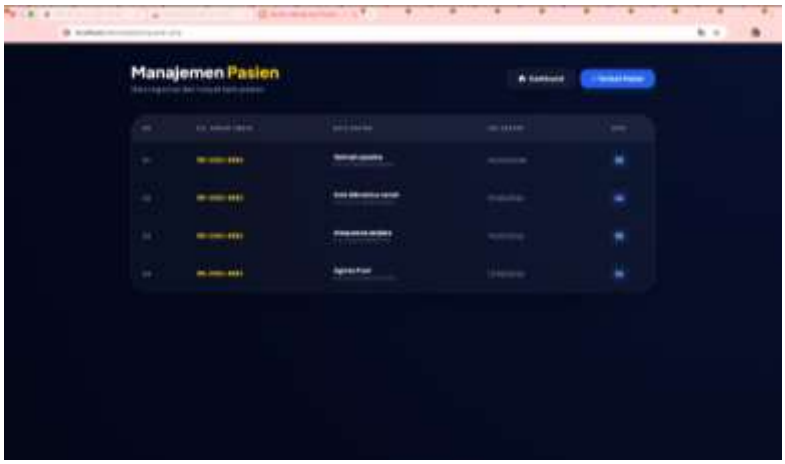

Figure 16. Manage Account

3.3.12 Financial Statements

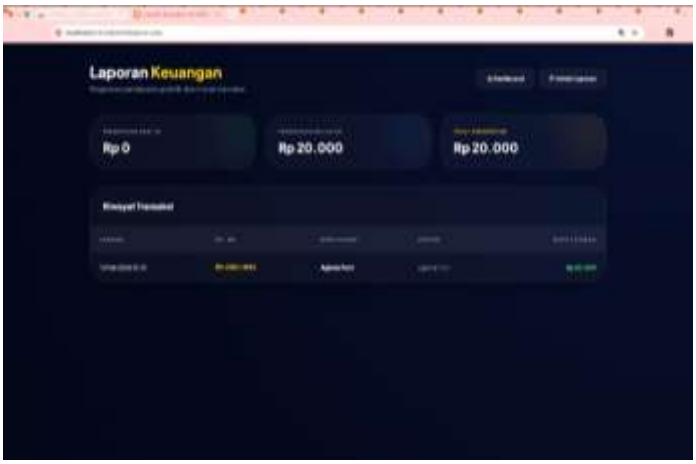

Figure 17. Financial Statements

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3.4 System Testing

System testing is carried out using *the Black Box Testing method*, which is a testing approach that focuses on validating system functionality based on the compatibility between the input provided and the output produced, without involving direct examination of the program code structure. This method was chosen because it is able to identify functional errors and ensure that all system features run according to the specifications that have been designed before the system is fully implemented.

Tests were conducted against 21 test scenarios covering all the main features of the system. In the authentication feature, the login and account registration test shows that the system successfully displays the dashboard page when the credentials entered are correct, as well as displays error messages and maintains the page when the input is invalid or the email is already registered. The main menu navigation also works well, where the system displays pages that correspond to the user's selected menu.

In the patient data management feature, testing input, editing, and deleting data shows results that are as expected. The system successfully saves data when all fields are filled in completely and correctly, displays error messages when the data is incomplete, and updates and deletes data accurately. The QR Code scan feature also works well, where the system is able to display patient data automatically based on the scanned QR code. Testing on the medical record feature includes successful input, failed input, edit, and delete data scenarios. All scenarios result in an appropriate system response, both in terms of complete storage of check data and error handling when the data is not filled in correctly. The same applies to the drug data management feature, where the operation of adding, editing, and deleting drug data runs as intended.

In addition, the medical card printing feature and financial statements successfully display and print documents according to the selected data. The logout feature also works well, where the system successfully ends the user's session and redirects them to the login page. Based on the overall test results, all system features show outputs that match the expected output. This indicates that the web-based medical record information system developed has met the functional specifications and is ready to be implemented in the General Practice of dr. Radi Yarman.

4. Conclusion

This research succeeded in designing and implementing a web-based medical record information system in the General Practice of dr. Radi Yarman which previously still relied on manual recording. The system developed is able to change the process of managing patient data to digital, so that the risk of data loss or damage can be minimized. The application of QR Code technology has been proven to speed up the process of patient identification and access to medical history without the need for manual file searching. Based on testing with the Black Box Testing method, all the main features of the system including user authentication, patient data management, medical record recording, QR Code scanning, medication management, and financial reports have functioned according to the specifications designed. This system is also in line with the government's policy direction in encouraging the digitization of primary health services through the provision of digital archives that are organized and easy to manage[18].

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