Design and Development of a Medical Record Management System at Griya Khitan Zaza Banyuwangi

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***Abstract*— Digitalization in Banyuwangi, particularly in healthcare services, has progressed through the implementation of SI LAJU. Griya Khitan Zaza, which has served over 1000 circumcision patients since 2007 and handles 60 general clinic patients daily, faces significant challenges in managing medical records manually. This manual management of patient medical records is less effective and prone to errors. Therefore, the aim of this research is to develop a comprehensive web-based medical record management system. The creation of this system involves evaluating system requirements, designing a user-friendly interface, implementing the interface design into the program using the Laravel framework, and rigorous testing with the blackbox method using the equivalence partitioning technique. This approach aims to improve operational efficiency and enhance the accuracy of patient data recording, with a test result showing 90.9% effectiveness. The ultimate goal is to significantly improve the quality of healthcare services at Griya Khitan Zaza and contribute to the overall advancement of information technology in the local healthcare sector.**

***Keywords*— Blackbox, Equivalence Partitions, Medical Records, RAD, System.**

I. INTRODUCTION

The rapid development of technology and information today has had a significant impact on various aspects of life, including the healthcare sector. Information technology is not only advancing quickly but also extending into healthcare services[1] Since its establishment in 2007, Griya Khitan Zaza in Banyuwangi has become an important pillar in community healthcare services, particularly in modern circumcision, general clinic services, and dental clinic services. Over the years, the clinic has gained the trust of the community through its commitment to high-quality healthcare and patient care. However, despite this success, the management of medical records at Griya Khitan Zaza is still done manually.

With more than 1000 circumcision patients served since 2007, and an average of 60 patients for the general clinic and 15 patients for the dental clinic daily, the manual handling of records has led to several challenges. These challenges include inefficiencies in operations, potential security breaches, and risks to data integrity. The current system is not only time-consuming but also prone to human error, which could affect patient care and the overall management of the clinic.

Given the increasing patient load and the need for accurate and timely medical records, the implementation of a web-based medical record management system has become an urgent necessity. Such a system would enhance operational efficiency by streamlining the record-keeping process, ensure better security for sensitive patient data, and maintain data integrity. This upgrade would enable Griya Khitan Zaza to continue providing excellent healthcare services and improve patient satisfaction and clinic management.

Medical records are factual accounts of a patient's condition, health history, past and current treatments, documented by healthcare professionals serving the patient. Medical record documentation is essential for recording findings, health and disease observations (past and present), laboratory tests, clinical services (medical and nursing care), and outcomes. It serves as evidence of the execution of patient care plans by healthcare providers [2]. Furthermore, this system includes an anamnesis form that needs to be integrated between the admin and doctors. According to Febriyanti and colleagues, who conducted research titled "Analysis of Completeness in Filling Out Anamnesis Form and Physical Examination of Surgical Cases," one of the forms in the operating room (OR) is the health history and physical examination form. Anamnesis is a direct examination technique conducted between doctors or nurses and patients, or through conversations with others who know the patient's condition, to gather patient data and receive medical care [3].

This system is built using the Laravel framework. Laravel is an open-source, free, PHP-based web framework developed by Taylor Otwell for developing applications or websites using the MVC architecture [4]. The programming language used is PHP, which is the most widely used scripting language today. PHP is commonly used for dynamic websites but can also be utilized for various other purposes [5]. MySQL is used to manage the database, which is a database management system for storing and managing data. A MySQL database is a collection of data stored in Tables and organized in such a way that it facilitates efficient retrieval and searching of data [6].The method employed in this research is RAD (Rapid Application

Development), which is a software development model focused on rapid and iterative collaboration. This approach enables the development team to design, develop, and test systems efficiently by actively involving users and stakeholders. The RAD method implements a development cycle consisting of iterative requirements analysis, design, construction, and testing [7] Testing in this system utilizes the blackbox approach, focusing on specific functional aspects, particularly the input/output processes of the system [8]. The testing technique employed is Equivalence Partitioning, which involves testing inputs on each menu within the medical record management system, categorizing them based on functionality [9] Blackbox testing using the equivalence partitioning technique aims to reduce the number of test cases [10].

This system is expected to address challenges such as increasing data volumes, inefficient manual recording, and growing workloads. The goal of implementing this medical record management system is to streamline patient data recording and storage processes, improve information access speed, and ensure data security and integrity.

II. METHOD

In designing and developing the web-based medical record system for Griya Khitan Zaza, a reference is made to software development methodologies to facilitate and streamline the stages of work. The stages of this research begin with data collection and the application of the RAD (Rapid Application Development) method in system development. The stages of the research flow using the RAD method are illustrated in Fig. 1.

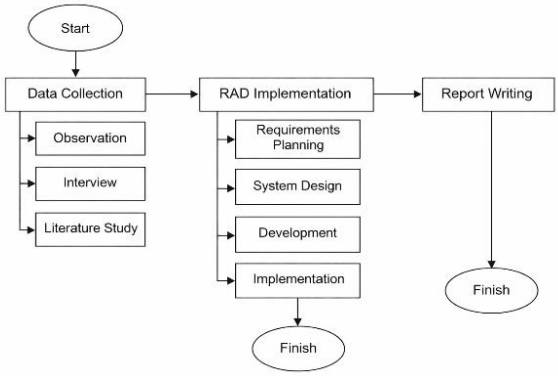

Figure 1 . Research Flow

A. Data Collection

Data collection aims to strengthen the rationale for conducting research. Additionally, through data collection, problem identification is conducted to clearly determine issues and assist in formulating appropriate solutions to support the system development process. The methods utilized include observation, interviews, and literature review.

1) Obervation: In this stage, data collection is conducted by directly observing the management of medical records at Griya Khitan Zaza. After gathering data through observation, the researcher records essential information regarding Griya Khitan Zaza's requirements for the medical record management system.

2) Interview: After conducting observation, the next step in data collection is interviews. The interviewing technique involves direct or indirect communication, such as through WhatsApp messaging and face-to-face interviews with stakeholders at Griya Khitan Zaza Banyuwangi, regarding the challenges faced by the institution.

3) Studi Pustaka: The stage after the interview is literature review. The literature review is conducted by gathering data through information search to support the research being conducted. This is to provide insights related to the web-based medical record management system design. Data collection through literature review involves gathering written sources, reading, studying, and taking notes on important aspects related to the discussed issue, specifically regarding web-based medical record management systems [11].

B. Impementation of RAD method

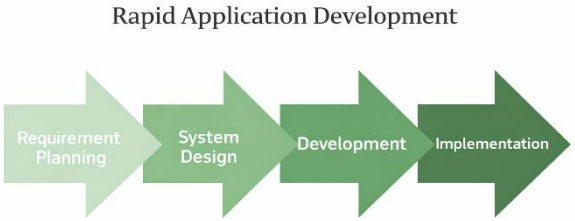

Figure 2. RAD Method Flow

Figure 2 shows the flow of the Rapid Application Development (RAD) method. Rapid Application Development (RAD) is a software development methodology that emphasizes rapid development cycles, with a focus on quick prototyping and iterative processes in development. This method is primarily used to create software quickly, efficiently, and within a short period of time [12]

1) Requirement Planning; Based on the user needs analysis results, the author can describe the system design flow, the actors involved, and the activities in the system to be. To broadly illustrate the proposed system, a use case diagram as shown in Fig. 3.

A use case diagram is a representation of the interaction between actors and components, used to depict the functional requirements expected of a system [13]From the use case diagram, it can be depicted that there are three actors: general doctor, dentist, and admin. The admin's responsibilities include filling out registration forms and anamnesis forms that include categorizing the clinic examinations to be conducted and body temperature.

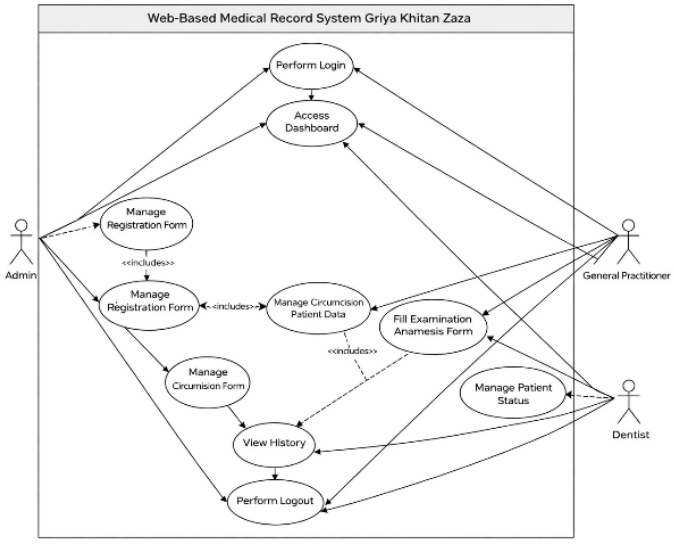

Figure 3. Use Case Diagram

Additionally, the admin can also fill out circumcision forms and access the patient's arrival history.The general doctor is tasked with completing the anamnesis form, which means it can be accessed in the medical record, and validating whether the patient has been examined or not. Furthermore, the general doctor can access the circumcision status of patients.The dentist is responsible for completing the anamnesis form for dental clinic patients, and accessing the patient's history and medical records.

Then, to design a database using MySql, the following is a database model of system as shown in Fig. 4:

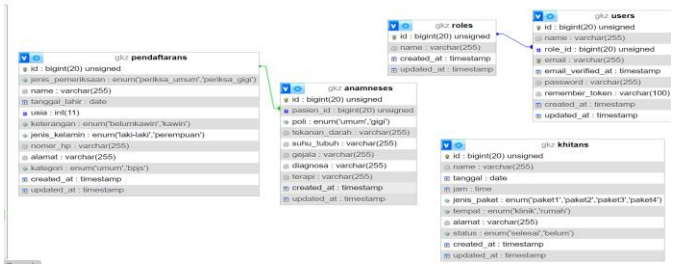

Figure 4. Erd

The explanation of the database system design diagram is that the "registrations" Table has a one-to-many relationship with the "anamneses" Table, and the "roles" Table has a one-to-one relationship with the "users" Table.

2) System Design: This phase involves design and improvement, where prototypes are created and demonstrated to partners for evaluation of the system design. During the RAD system design process, users from Griya Khitan Zaza respond to the prototype demonstrated by the author, and the author refines the modules designed based on user feedback.

3) Development: The system design is translated into program code, and the system enters the programming phase. The system is developed based on the approved prototype design from the system design phase, which has been agreed upon by the partners. During this stage, testing is also conducted before the system is launched to Griya Khitan Zaza. The testing utilizes the blackbox method of Equivalence Partitioning technique. In testing, the author uses the blackbox Equivalence Partitioning technique. The first stage begins by determining test cases for the software using equivalence partitions and initializing input and output partition classes [14].

4) Implementation: In this phase, the system will be deployed or handed over to users. The plan is to launch the system at Griya Khitan Zaza, where it will be used by admins and doctors at Griya Khitan Zaza.

III. RESULTS AND DISCUSSION

A. Result of System Development

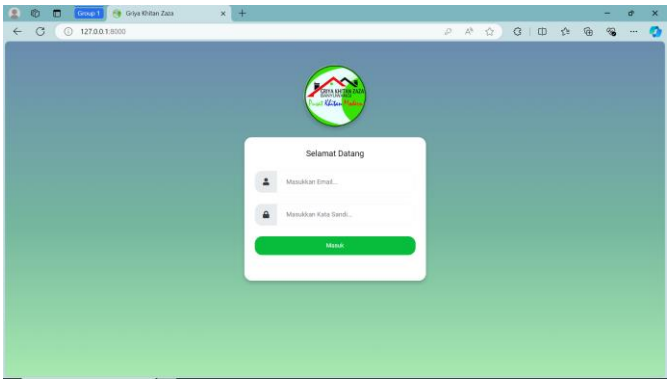

Figure 5. User Admin,General Practical, And Dentist Login Page

The login interface for admin, general practitioner, and dentist users is shown in Fig. 5. On the login page, the display for each user is the same, and for login credentials the system uses Seeder, and has been provided, therefore users do not need to register.

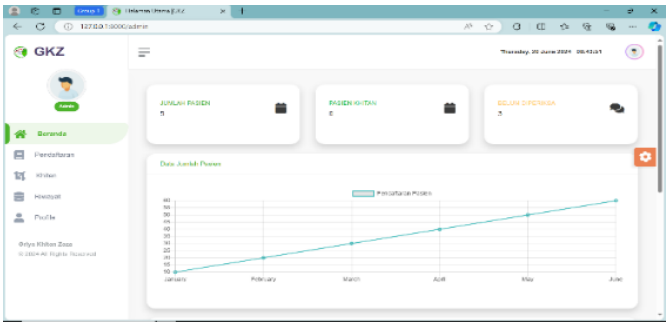

Figure 6. Admin Dashboard Display

The admin dashboard interface is presented in Fig. 6.. On the admin dashboard display there is a card that shows the number of patients, the number of circumcision patients, as well as the number of patients who have not been examined. These three cards are dynamic, and a graph of the number of patient registration data is also displayed.

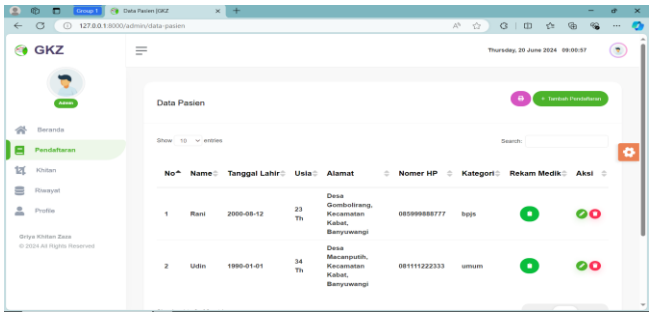

Figure 7. Registration Admin

The admin registration interface is shown in Fig. 7. In the registration form for the admin, there is a Table containing patient data that is entered once when the patient registers by the admin.

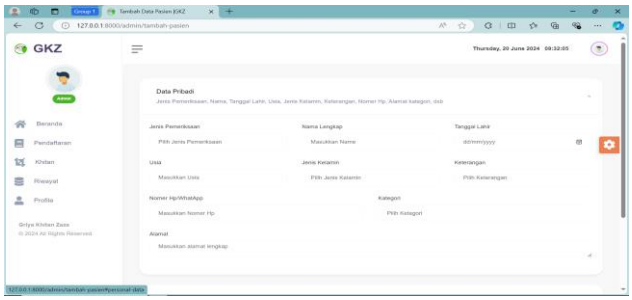

Figure 8. Form To Fill In Patient Registration Data

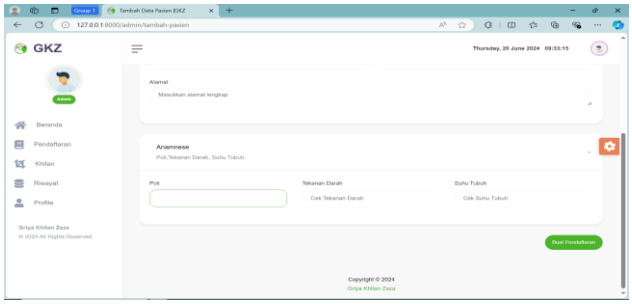

Figure 9. Patient Anamnesis Form

The patient registration form and anamnesis form are illustrated in Fig. 8 and Fig. 9. In the registration form, there are several inputs for personal information, particularly in the department section. If either the dental or general department is selected in the registration form, the corresponding department's anamnesis form will automatically be filled out. The registration data submitted by the admin will be integrated into the system used by both general doctors and dentists. Each doctor will receive patients based on the department they handle.

The circumcision registration form is shown in Fig. 10. On the circumcision form there is the reservation registration date, and reservation time, as well as the choice of package,used, then the choice of place, and the patient's address. The general doctor dashboard and patient registration table are shown in Fig. 11 and Fig. 12.

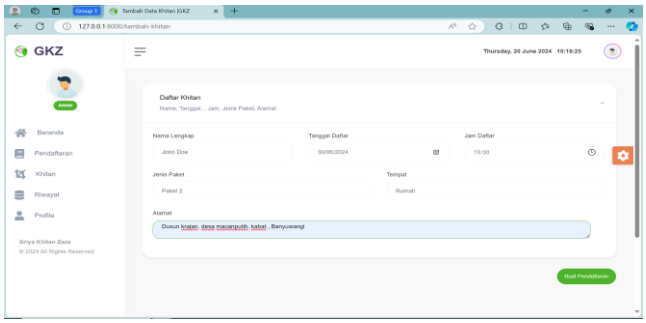

Figure 10. Circumcision Form

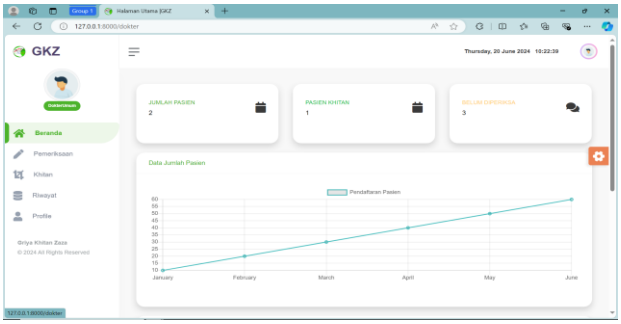

Figure 11. General Doctor Dashboard

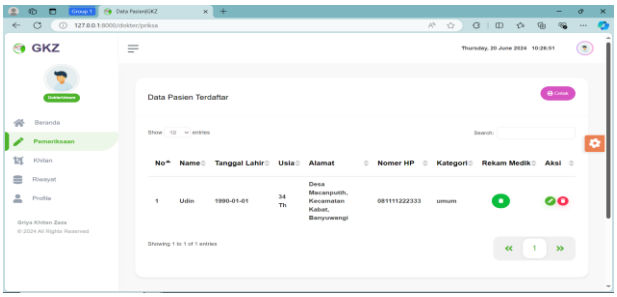

Figure 12. Display Of The General Patients Registation Table

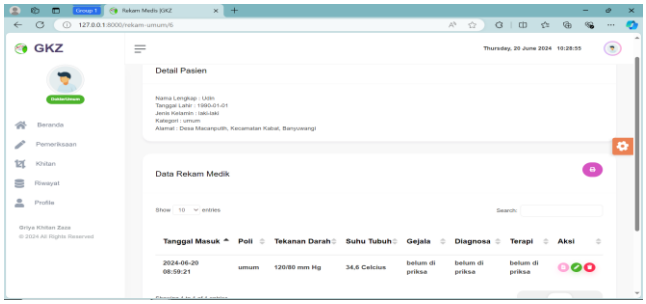

Figure 13. Patient Medical Record Details

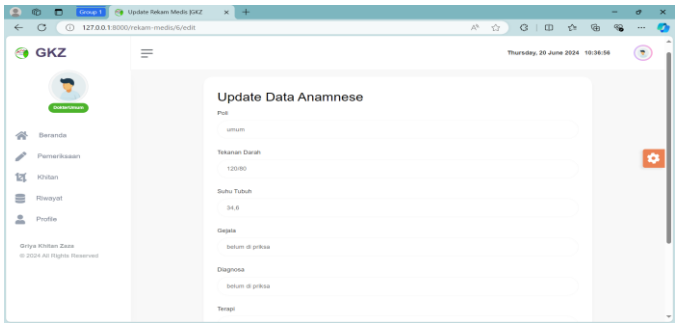

Figure 14. Update Anamnese Data By a General Doctor

The detailed medical record view and anamnesis update interface for general doctors are shown in Fig. 13 and Fig. 14. In the registration process, the general practitioner accesses the patient's medical record and updates it to finalize the history-taking form previously filled out by the admin. The required data includes symptoms, diagnosis, and therapy. Prior to finalization, the input will automatically include unchecked information.

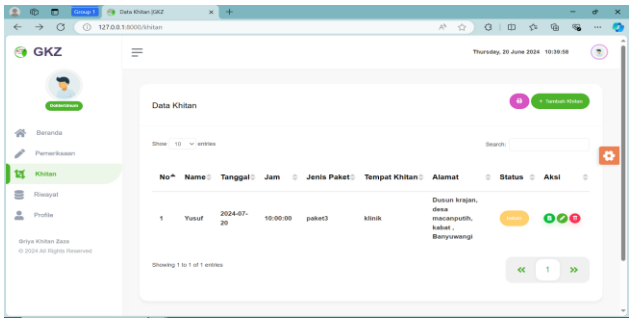

Figure 15. General Doctor's Circumcision Registration Table

The circumcision registration table for general practitioners is shown in Fig. 15. Circumcision data registration form, general practitioners can validate circumcision patients who have been treated.

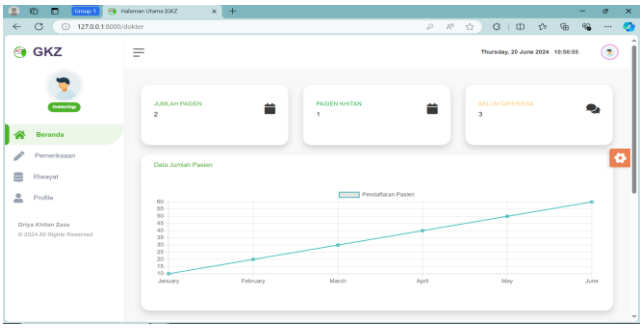

Figure 16. Dashboard At The Dentist

The dentist dashboard and dental examination registration table are shown in Fig. 16 and Fig. 17. The dentints does not have access to circumcision procedures, the role of the dentins is solely to handle patients in the dental clinic.

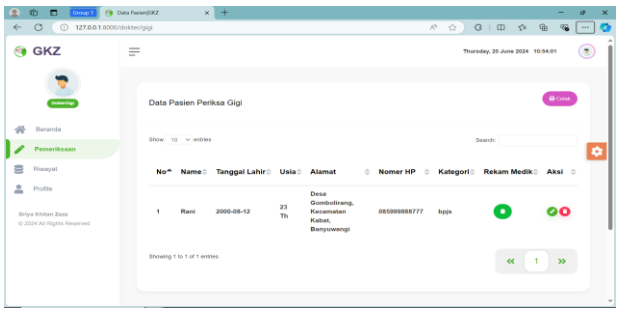

Figure 17. The Registration Table Data Is Accessed Under The Dental Examination Menu

The data obtained from the examination input by the admin will be managed by the dentins specifically for patients in the dental clinic. The dentist also has the authority manage the patient medical record.

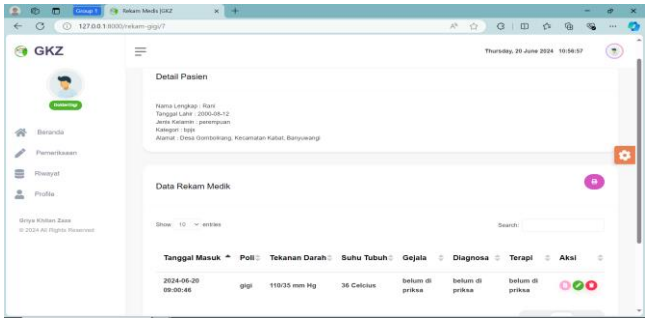

Figure 18. Detailed patient medical records

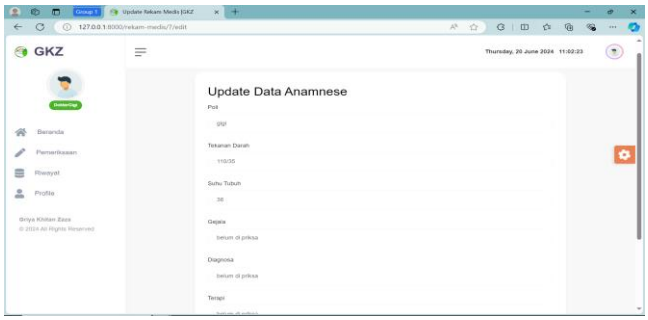

Figure 19. Update Anamnesis Data

The detailed patient medical record and anamnesis update interface for dentists are shown in Fig. 18 and Fig. 19. In the registration Table, the dentist accesses the patient's medical records and edits them to complete the anamnesis form previously filled out by the admin. The required data to be completed includes symptoms, diagnosis, and therapy. Before completion, the input automatically indicates that the information has not been checked.

B. System Test Result

The authentication testing scenarios and results are presented in Table I.

TABLE I
AUTHENTIFICATION TESTING

Id	Test Scenario	Test Case	Expected Outcome	Test Result	Status
1.	Logging in with correct username	Username : correct Password: correct	User successfully logs into the system	User successfully logs into the system	Valid
2.	Logging in with incorrect username	Username : wrong Password: correct	System gives a warning,user cannot log into the system	System gives a warning,user cannot log into the system	Valid
3.	Logging in with incorrect password	Username : correct Password: wrong	System gives a warning,user cannot log into the system	System gives a warning,user cannot log into the system	Valid

4.	Logging in with incorrect combination of username and password	Username : wrong Password: wrong	The system provides a warning, the user cannot log into the system.	The system issues a warning that the user cannot log into the system.	Valid

The functional testing results for managing patient data are summarized in Table II.

TABLE II
FUNCTIONAL TESTING MANAGES PATIENT DATA

Id	Test Scenario	Test Case	Expected Outcome	Test Result	Status
1.	Adding patient data	Entering complete patient data	Patient data can be saved	Patient data successfully	Valid
2.	Adding patient data with some fields left empty	Entering incomplete patient data by leaving some fields empty	Data cannot be saved and auto-scrolls to the empty field	Data not saved and auto-scrolls to the empty field	Valid
3.	Adding complete anamnesis form	Filling out the anamnesis form completely	The filled data is sent to each respective doctor	The filled data is sent to each respective docto	Valid
4	Adding incomplete data to the anamnesis form	Incomplete filling of the anamnesis form fields	Data is not saved and the system auto-scrolls to the unfilled field	Data is not saved and the system auto-scrolls to the unfilled field	Valid
5.	Adding circumcision data by filling out the entire form	Filling out all fields in the circumcision form	Circumcision data is successfully saved	Circumcision data is successfully saved	Valid
6.	Adding circumcision data with incomplete fields	Filling out some fields incompletely in the circumcision form	Circumcision data is not saved and the system auto-scrolls to the unfilled fields in the form	Circumcision data is not saved and the system auto-scrolls to the unfilled fields in the form	Valid
7.	Adding patient anamnesis data in a different clicic during the next registration	Entering the clinic name in the patient anamnesis form	Previously registered patients can add new anamnesis in a different clinic	Previously registered patients can add new anamnesis in a different clinic	False

The ability of a system to operate according to the user's expectations is called effectiveness. The effectiveness of a system influences the determination of whether the system implementation has been successful or not. Functionality improves as the effectiveness increases [15]. Based on research conducted by Aufa and colleagues [10], referring to the reference standards of the Litbang Depdagri in 1991, the effectiveness of a system is measured as shown in the following Table III:

TABLE III
FUNCTIONAL TESTING MANAGES PATIENT DATA

Effectiveness Ratio	Achievement Level
0-40	Very ineffective
40-55.99	Ineffective
60-79.99	Quite effective
80-100	Very effective

To calculate the effectiveness of the testing, the following formula is used equation 1:

$$\left(\frac{\Sigma\, Successful\ Test}{\Sigma\ \text{Scenario Test}}\right) \times 100\% \quad (1)$$

IV. CONCLUSION

The implementation of the web-based medical record management system at Griya Khitan Zaza successfully addressed several major challenges, such as the increasing amount of data, inefficient manual record-keeping, and the growing workload. This system has proven effective in streamlining the process of recording and storing patient data, enhancing the speed of information access, and ensuring data security and integrity. The results of this study demonstrate good integration between the admin, general doctors, and dentists, as well as more structured storage of circumcision registration data. The use of a local server for this system's implementation added reliability and speed of access. An effectiveness rate of 90.9% indicates that the system operates well. In the future, further development is expected to continue improving the system's functionality and efficiency.

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