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Digitalization of Patient Registration at UPT. Puskesmas Dersalam Kudus Through a Web-Based Information System

Khirda La'aliya Firdaus[1*], Pratomo Setiaji[2], Muhammad Arifin[3]

[1, 2, 3] Information Systems Study Program, Faculty of Engineering, Universitas Muria Kudus, Kudus 59327, Indonesia

Corresponding Author Email: 201853082@std.umk.ac.id

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ABSTRACT

The Community Health Center is a government agency engaged in the field of public health services and is responsible for organizing health development in its working area. UPT. Dersalam Kudus Community Health Center faces challenges in the form of a high number of patients every day, which often causes long queues. Until now, the patient registration process is still carried out conventionally, where patients must come directly to get a queue number. This method is considered less efficient, especially for patients with poor health conditions, because they have to wait for a long time. In addition, registration data must be manually summarized into Microsoft Excel, which is time-consuming, especially in data searches and reporting. This makes UPT. Dersalam Kudus Community Health Center need a web-based information system that can be used as a medium for online health services. This system is built using the Hypertext Preprocessor (PHP) programming language and utilizes the MySQL database. The development method used is the Waterfall method, with system design carried out using the Unified Modeling Language (UML) and Entity Relationship Diagram (ERD). System testing using Black box by testing the functionality of the program created, the results of the study are expected to provide effective solutions to overcome the problem of long queues and data management, thereby increasing the efficiency and quality of service at UPT. Dersalam Kudus Health Center.

1. INTRODUCTION

The development of technology and communication is increasing rapidly day by day. Almost all fields of work today have utilized various technological advances, especially in IT-based technology. The use of various technologies, one of which is the use of computer applications / software in various fields of work. This is done in addition to meeting standards, of course, to facilitate the performance of the workers themselves. not only that, the use of applications / software is also intended so that access to a job can be done more effectively and efficiently. Especially in today's era where long-distance communication is highly prioritized. No exception UPT. Dersalam Kudus Health Center as one of the first-level health service institutions in Kudus Regency has an important role in providing efficient, fast, and precise services to the community.

As the need for optimal health services increases, Community Health Centers face various challenges, including the patient registration process which is still done manually. This manual process often causes various problems, such as long queues, long waiting times, and potential errors in recording patient data. UPT. Dersalam Kudus Community Health Center is one of the health institutions that until now still uses the conventional registration method, where patients must come directly to the health center to register. This is considered inefficient, because patients must come directly to the health center to get a queue number, so it is not uncommon for patients to have to wait quite a long time to get service. Moreover, patients who are in poor condition are required to wait quite a long time if they get the back queue number. In addition, the registration data that has been recorded must be recapitulated into the manual office application. Searching for data is also quite time consuming because you have to search for file by file. Likewise when reporting activities are quite time consuming.

This makes UPT. Dersalam Kudus Health Center need an information system that can be a solution to the problems and obstacles that occur. Digitizing the patient registration process through a web-based information system provides an opportunity to improve the efficiency of health services. This system allows patients to register independently, either via computer or smartphone, thereby reducing the administrative burden on health center officers. In addition, the web-based system offers easy access for patients, more organized data management, and allows integration with other systems, such as electronic medical records and population data. Thus, the implementation of this system not only improves the quality of service, but also supports digital transformation in the health sector. This study aims to develop and implement a web-based registration information system at UPT. Dersalam Kudus Health Center. The results of this study are expected to

provide a real contribution to the development of health services at the health center level, as well as being a reference for other health institutions that want to adopt similar technology.

2. RESEARCH METHODOLOGY

Based on previous research by (Sihombing & Irawan, 2019) entitled "Design of Patient Registration Information System Using Vb.Net at Pratama Clinic Rbg Rz Bandung" states that Pratama Clinic RBG RZ is one of the clinics located in Bandung whose activities serve health services such as outpatients, inpatients, Dental Polyclinics and patient inpatient rooms. The information system in the clinic that is currently running is still done manually, resulting in less than optimal service. With the above conditions, an integrated system is needed with the help of computer technology to process patient registration data at Pratama Clinic RBG RZ Bandung. However, in designing the system, the VB.Net program is still used, which is considered less responsive to current technological developments.

In a study conducted by (Sofyan & Bahar Harahap, 2019) in a study entitled "Design of an Outpatient Registration Information System Based on Visual Basic at Imelda Hospital". States that electronic medical records are lifetime medical records of patients in electronic format about a person's health written by one or more health workers in an integrated manner at each meeting between health workers and clients. The purpose of the study was to find out how to design an outpatient registration information system at Imelda Hospital, Indonesian workers and to find out the flow and shortcomings in the implementation of computerized medical records. However, in designing the system, the Visual Basic program is still used, which is considered less responsive to current technological developments.

According to [3] in his research entitled "Design of Web-Based Patient Registration Information System with Fingerprint in Health Center" stated that Surisina Health Center is a health center that handles public health services. Surisina Health Center does not yet have an information system for processing outpatient data so that officers must input patient visit data into Microsoft Excel manually every day to be used as a report, and the information produced is less accurate. For this reason, a patient data and information management system was created using a patient registration information system. However, it is not yet equipped with examination history, examination schedule, and employee data.

In a study conducted by (Wijanarko & Kasimo, 2021) in a study entitled "Creating a Web-Based Patient Registration Application at the Kampung Dalam Health Center" states that the health center is a government agency engaged in the field of public health services. The health center is responsible for organizing health development in a work area. The Kampung Dalam Health Center in the process of processing outpatient registration data has a system that is less than optimal in recording patient data and is not well structured, so that in terms of the patient service process it takes a long time. However, the system design has not been equipped with a patient registration report, and has not been equipped with a recap of the patient's examination history.

Based on previous research by (Firmansyah & Irawan, 2021) entitled "Design of Patient Registration Application at Uptd Bumi Emas Health Center, East Lampung" states that patient registration will run well if the technology system used is computerized, so it is very possible to carry out data collection and processing faster. The system created is in the form of a design for patient data input, patient visit data, and the output is in the form of a patient visit data report. However, in designing the system, the Borland Delphi 7 program is still used, which is considered less responsive.

According to (Hambali, Juhartini & Arianto, 2023) in their research entitled "Implementation of Inpatient Registration Information System Using Codeigniter 4.0 at Gunungsari Health Center" UPTD Bumiemas Health Center in processing patient registration data still uses the bookkeeping method (ledger), so there are still many obstacles in data processing. For this reason, one of the efforts to improve health services for patients really needs an innovation related to patient data processing so that the data produced is more effective and can shorten the time period and can also reduce the level of duplicate data and can produce accurate and accurate reports. The development of the system was made using the Codeigniter 4.0 framework programming language. However, it is not yet equipped with polyclinics and types of patients who register.

Based on previous research by [7] entitled "Design of a Mobile-Based Health Center Patient Registration System" states that the Pandak I Health Center is a government agency that operates in the health sector. There are many obstacles faced by the health center, including: errors in entering and storing data and copying important patient documents. Therefore, data processing becomes inefficient and inefficient. This can hinder the flow of reports and services to patients. However, it is not yet equipped with examination history, employee data, and examination schedules.

2.1 Data Collection Methods

In this article, the methods used for data collection to obtain the necessary information for system design are as follows:

1. Primary Data Sources
   a. Interviews
      Using the interview method, direct interviews were conducted with the relevant parties at UPT Puskesmas Dersalam Kudus, particularly those involved in managing services and the patient registration process.
   b. Observation
      To clarify the data collected, the author also visited UPT Puskesmas Dersalam Kudus to directly observe and examine the patient registration service process.

2. Secondary Data Sources
   a. Literature Study
      The literature study method is a data collection technique used to gather information from books, such as software engineering textbooks, related reports, and theoretical foundations. This method helps provide theoretical support and serves as a comparison for the research to be conducted. By reviewing references from previous thesis reports and academic works, the researcher can gain insights into existing knowledge, identify proven methods, and benchmark the current study against prior research.
   b. Documentation Study
      The documentation study method involves collecting data from literature and documentation sources such as

the internet, books, or other information resources. In this research, the data collection process will involve requesting data directly from the research object, such as information regarding the patient registration process, the data used for registration, and other relevant details. This approach ensures that the information and data obtained are valid and reliable, as it is directly sourced from the subject of the study, allowing for a more accurate analysis and system design.

2.2 System Development Methods

The development method applied in this study is the development of the waterfall method. According to (Purnia, Rifai & Rahmatullah, 2019), in her research, Where it can be described in this method is the systematic presentation of a report, namely starting from a general description, in addition, it will be described specifically at the end of the report chapter.

1. Analysis and Definition of Service Requirements, Limitations, and System Goals
   This phase involves determining the service requirements, limitations, and objectives of the system through consultation with the users. In this case, the author conducted interviews and direct observations to gather the necessary data for the system development.
2. System and Software Design
   This activity focuses on determining the overall architecture of the system. The author designed the system flow using the Unified Modeling Language (UML) methodology to map out the processes, user interactions, and system components clearly.
3. Implementation and Unit Testing
   The system design is realized as a series of programs. During this phase, the author created a database based on the design from the previous stage. The author also wrote the code and completed it to ensure that the system functions correctly and efficiently.
4. System Integration and Testing
   After the individual units are developed, they are integrated and tested as a complete system to ensure that the system meets all requirements.
5. System and Software Maintenance
   This phase involves ongoing maintenance of the system and software to ensure it continues to function effectively. Maintenance activities include troubleshooting, bug fixes, and updates to keep the system running smoothly and adapt to any changes in user needs or requirements.

2.3 System Development Methods

The standardization of modeling languages for developing application programs emerged with the development of object-oriented programming techniques, one of which is Unified Modeling Language (UML). [9] UML is essential because it provides a visual model to describe, specify, construct, and document an application system. UML is a visual language used for modeling and communication about systems, utilizing diagrams and supporting texts. The types of diagrams in Unified Modeling Language (UML) include:

1. Use Case Diagram
   A Use Case Diagram is used to model the application system that will be designed. It describes the interaction between different actors and the system, illustrating how users and external systems will interact with the proposed system. It helps define the system's functionality from the user's perspective.
2. Class Diagram
   A Class Diagram describes the system's structure by defining the classes that will be created to form the system. It shows the attributes (data elements) and operations (functions or methods) of each class. This diagram serves as a blueprint for the development of the system's data model.
3. Sequence Diagram
   A Sequence Diagram illustrates the behavior of objects within a use case, showing how objects interact over time. It highlights the flow of messages between objects, their activation, and how they communicate during the execution of a process or operation.
4. Activity Diagram
   An Activity Diagram represents the flow of activities or processes within the system. It can be used to model business processes, workflows, or the steps involved in specific tasks within the application. This diagram shows how activities transition from one to the next and can model decision points and parallel activities.
5. Statechart Diagram
   Known as a state machine diagram, a Statechart Diagram describes changes in the state or status of a system or object. It represents the lifecycle of an object, showing its different states and the events that trigger transitions between those states. It is useful for modeling systems that respond to various conditions or inputs.

3. RESULTS AND DISCUSSION

3.1 System Design Analysis

The results of the system and software design phase, using the UML method and database design, are illustrated using ERD (Entity-Relationship Diagram) and table relationships.

1. Software Design
   a. Business Use Case Diagram
      The Business Use Case Model is necessary to clarify the business context of the software being developed. It is optional and can be depicted in one or more Business Use Case Diagrams. This diagram is used to present the functions provided by the entire organization. It is used during the business activity modeling phase and helps establish the system context, forming the foundation for the development of the use case diagram. The business flow for the Patient Registration System is depicted in a Use Case Diagram to visually explain the business activities of UPT. Puskesmas Dersalam Kudus. The Business Use Case Diagram provides a clear overview of the system's processes and interactions within the organization. Figure 1 below illustrates the Business Use Case Diagram:

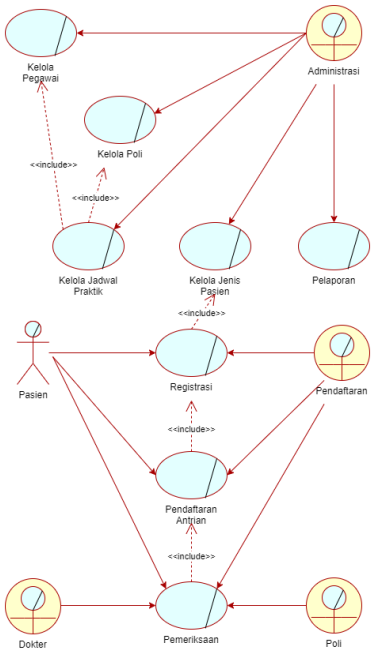

Figure 1. Business Use Case Diagram

b. System Use Case Diagram

The System Use Case Diagram describes the interaction between one or more actors and the information system to be created. This diagram provides an overview of the interactions between the actors (such as users or external systems) and the various use cases (functions or processes) within the system. It is a key part of the system's design, as it outlines the primary actions and how different users will interact with the system. The System Use Case Diagram for this research is shown in figure 2 below:

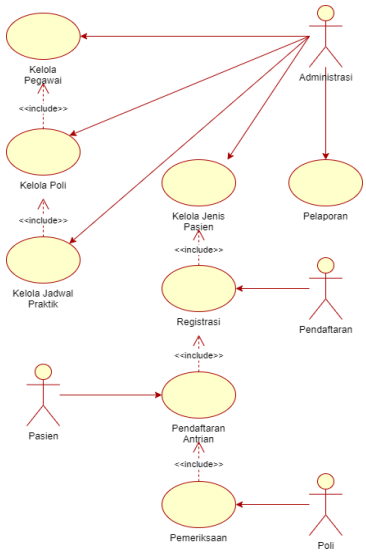

Figure 2. System Use Case Diagram

c. Class Diagram

A Class Diagram illustrates the structure of the system by defining the classes that will be created to build the system. It defines the properties and behaviors of the classes, represented by attributes and operations. The Class Diagram is crucial for understanding the system's data model and how various components of the system interact with one another. Figure 3 below shows the Class Diagram that forms part of the design for the proposed system:

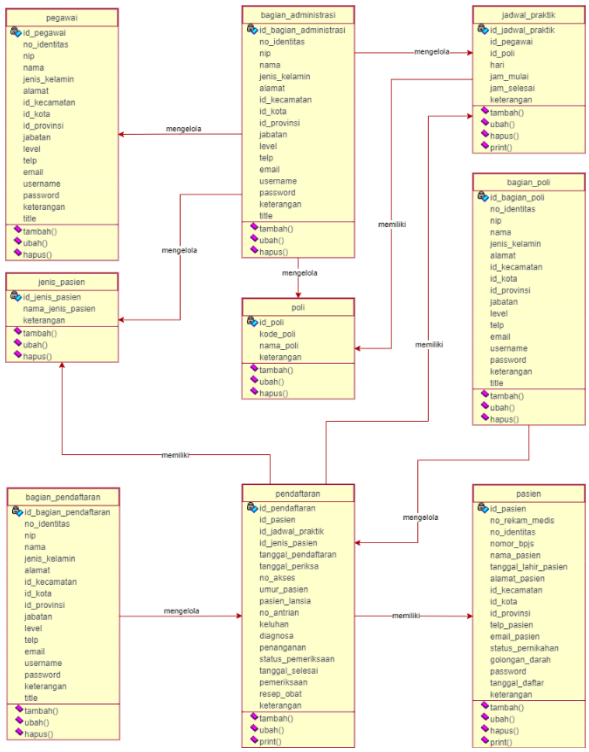

Figure 3. Class Diagram

2. Database Design

a. Entity Relationship Diagram (ERD)

The Entity Relationship Diagram (ERD) is used as a model for relational database design. ERD is a visual representation to model the relationships between entities in a system or database. It helps to depict the structure and the relationships between entities, attributes, and cardinalities in a relational system or database. The ERD is essential for understanding how data will be organized, how entities relate to each other, and how they interact within the system. It provides a blueprint for the database structure and is crucial for ensuring data consistency and integrity. [10] Figure 4 below shows the Entity Relationship Diagram (ERD) for the proposed system:

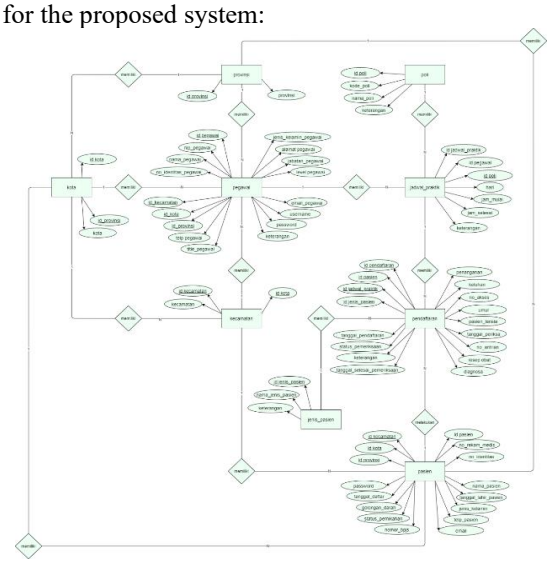

Figure 4. Entity Relationship Diagram (ERD)

b. Table Relationships

The table relationships formed in the database for the implementation of the Digital Patient Registration System at UPT Puskesmas Dersalam Kudus through a Web-Based Information System are depicted in figure 5 below:

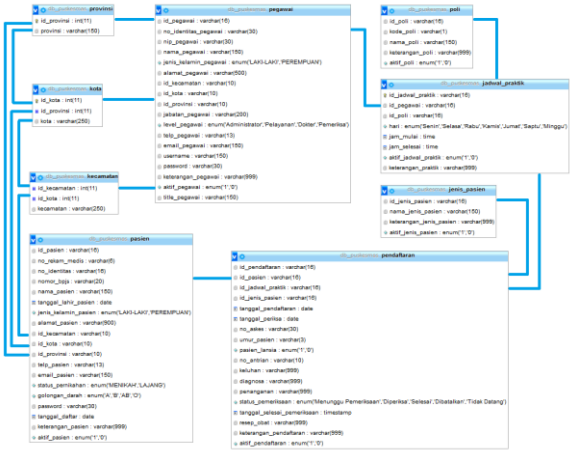

Figure 5. Table Relationships

3.2 Interface Design

The interface design for the Digital Patient Registration System at UPT Puskesmas Dersalam Kudus through a Web-Based Information System is developed using the PHP programming language and MySQL database. This process involves utilizing the Visual Studio Code text editor and a browser to run the application. Below is the system interface display.

1. Login Page

This page is the Login screen, which is accessed first when opening the system. It serves as the entry point for user authentication, ensuring that only authorized users can access the system based on their designated user levels. The login page is where users input their credentials to verify their identity before gaining access to the system's functions. The display of the login page is shown in figure 6 below:

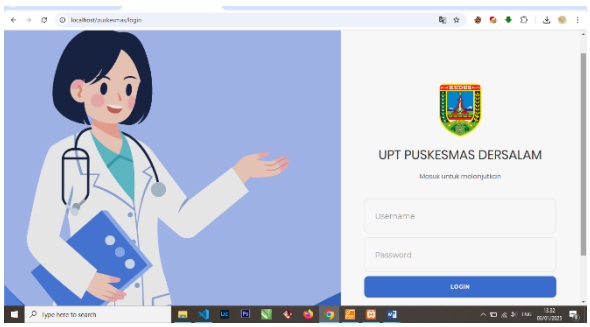

Figure 6. The display of the login page

2. Dashboard Page

This page is the Dashboard screen, which contains the main information and the primary menus provided in the system. The dashboard serves as the central hub where users can navigate to various features and view key information at a glance. The display of the dashboard page is shown in figure 7 below:

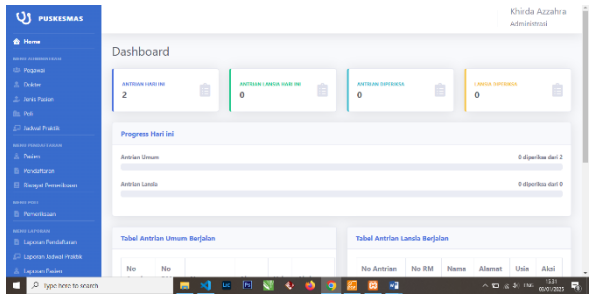

Figure 7. The display of the dashboard page

3. Employee Page

This page is the Employee screen, which is used for managing employee data. It allows users to add, edit, and update employee information. The page includes a pop-up form for adding and modifying employee details, making it easy to maintain an up-to-date list of employees in the system. The interface display of the Employee Page is shown in figure 8 below:

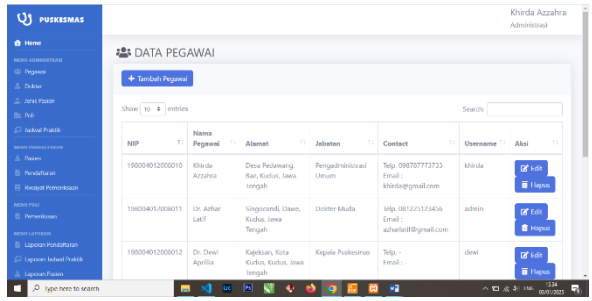

Figure 8. The interface display of the Employee Page

4. Doctor Page

This page is the Doctor screen, specifically designed for managing the data of employees with the role of doctor. It allows users to view, add, edit, and update the information related to the doctors within the system. The interface display of the Doctor Page is shown in figure 9 below:

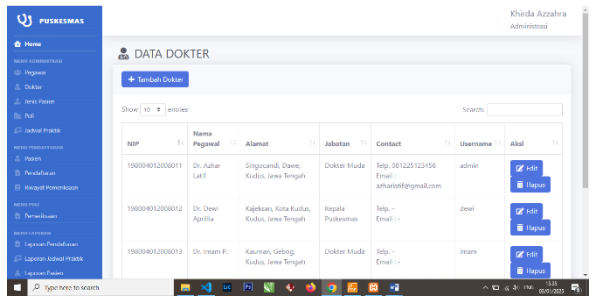

Figure 9. The interface display of the Doctor Page

5. Patient Type Page

This page is the Patient Type screen, used for managing the different types of patients in the system. It allows users to categorize and update patient types, which could include various classifications such as regular patients, emergency patients, or others based on the system's needs. The interface display of the Patient Type Page is shown in figure 10 below:

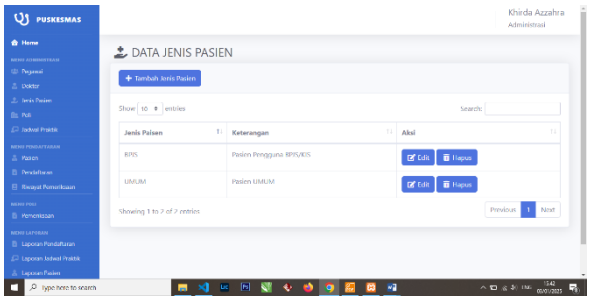

Figure 10. The interface display of the Patient Type Page

6. Poli Page

This page is the Poli screen, which is used for managing the various polyclinics (poli) available at the health center (Puskesmas). It allows users to view, add, edit, or remove polyclinic data as needed. The interface display of the Poli Page is shown in figure 11 below:

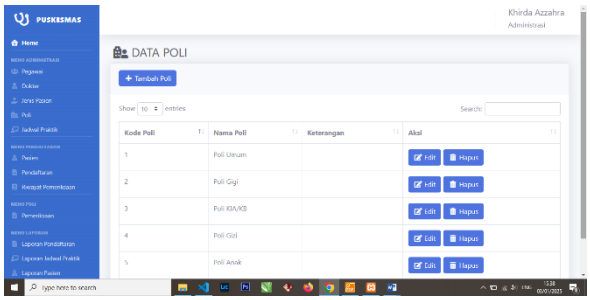

Figure 11. The interface display of the Poli Page

7. Practice Schedule Page

This page is the Practice Schedule screen, used for managing and displaying the practice schedules of doctors at Puskesmas Dersalam. It allows users to view, add, update, and manage the schedules of doctors and available time slots for patient appointments. The interface display of the Practice Schedule Page is shown in figure 12 below:

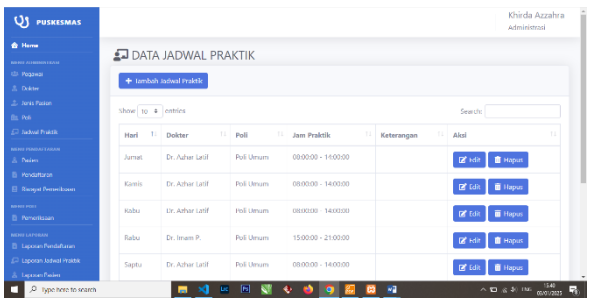

Figure 12. The interface display of the Practice Schedule Page

8. Patient Page

This page is the Patient screen, which is used for managing patient data. It allows users to view, add, edit, and update patient information, including details such as personal data, medical history, and registration information. The interface display of the Patient Page is shown in figure 13 below:

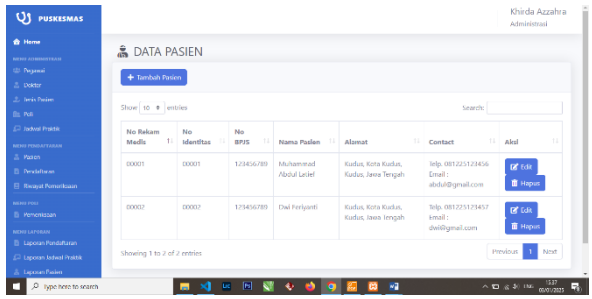

Figure 13. The interface display of the Patient Page

9. Registration Page

This page is the Registration screen, which is used for managing patient registration data. It allows users to add new patient registrations, view and update existing registration information, and manage appointment details. The interface display of the Registration Page is shown in figure 14 below:

Figure 14. The interface display of the Registration Page

10. Examination History Page

This page is the Examination History screen, which is used to present the historical examination data of patients, processed from the patient registration data. It provides an overview of past medical examinations, diagnoses, and treatments associated with a particular patient. The interface display of the Examination History Page is shown in figure 15 below:

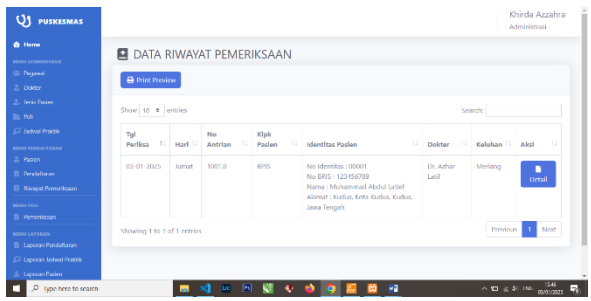

Figure 15. The interface display of the Examination History Page

11. Examination Page

This page is the Examination screen, which is used to manage examination data derived from patient registration information. It allows healthcare providers to input, update, and view examination results for patients. The interface display of the Examination Page is shown in figure 16 below:

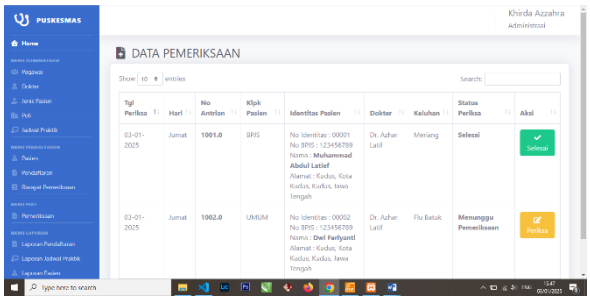

Figure 16. The interface display of the Examination Page

12. Profile Page

This page is the Profile screen, which is used to manage and update the profile information of the system users, typically derived from patient data or user accounts. It allows users to view and modify their personal details, including contact information, role, and other relevant data. The interface display of the Profile Page is shown in figure 17 below:

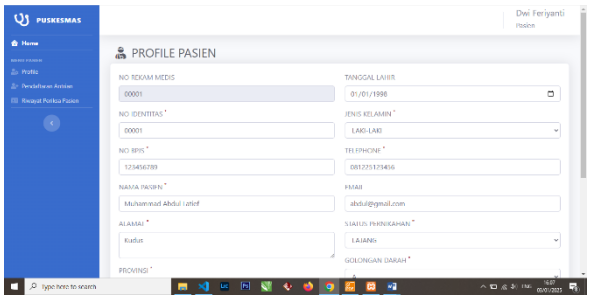

Figure 17. The interface display of the Profile Page

13. Queue Registration Page

This page is the Queue Registration screen, used for managing the patient queue list. It allows users to view and manage the patients in the waiting list for their appointments, ensuring an organized flow of patient registrations. The interface display of the Queue Registration Page is shown in figure 18 below:

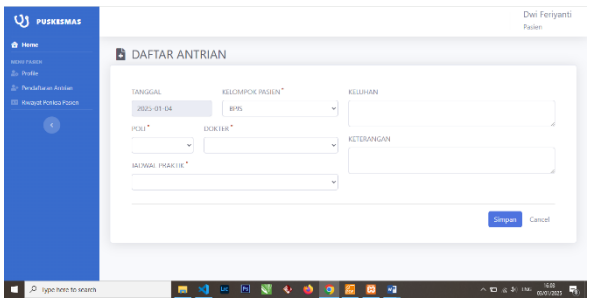

Figure 18. The interface display of the Queue Registration Page

14. Patient Examination History Page

This page is the Patient Examination History screen, which displays a list or data of the patient's examination history, derived from the queue registration data. It allows users to review previous medical examinations, diagnoses, and treatments that were administered to a specific patient. The interface display of the Patient Examination History Page is shown in Figure 19 below:

Figure 19. The interface display of the Patient Examination History Page

15. Registration Report Page

This page is the Registration Report screen, which displays reports of patient registrations. It allows users to view and generate reports based on patient registration data, helping administrators and medical staff track patient inflows and manage appointments more effectively. The interface display of the Registration Report Page is shown in figure 20 below:

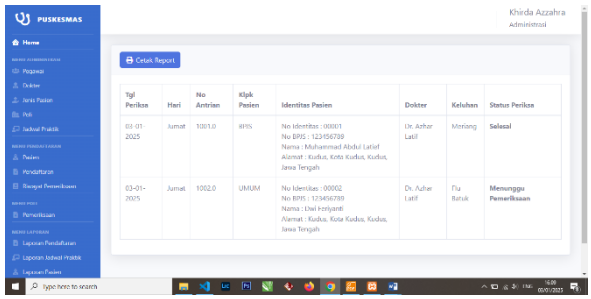

Figure 20. The interface display of the Registration Report Page

16. Practice Schedule Report Page

This page is the Practice Schedule Report screen, which displays reports on the practice schedules of doctors and staff. It allows users to view and generate reports based on the practice schedules, helping both patients and medical staff stay informed about available time slots for consultations. The interface display of the Practice Schedule Report Page is shown in figure 21 below:

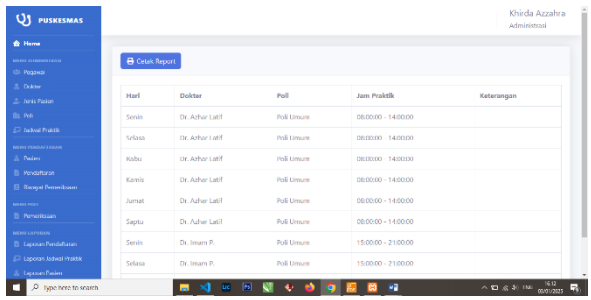

Figure 21. The interface display of the Practice Schedule Report Page

17. Patient Report Page

This page is the Patient Report screen, which displays reports on patient data. It allows users to generate and view detailed reports on patient information, helping medical staff and administrators track patient demographics and medical

histories efficiently. The interface display of the Patient Report Page is shown in figure 22 below:

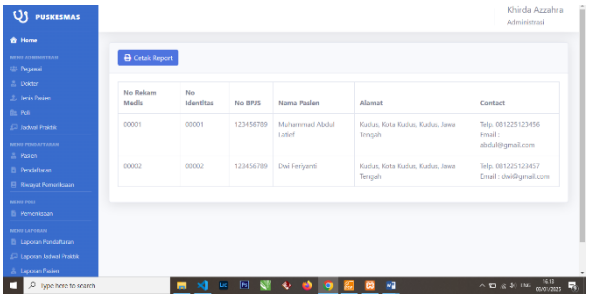

Figure 22. The interface display of the Patient Report Page

4. CONCLUSIONS

4.1 Conclusion

Based on the results of the analysis and design, as well as the implementation and discussion in the previous chapters, the author can provide the following conclusions:

1. This study produces a patient registration application for UPT. Dersalam Kudus Health Center based on a website, PHP programming language and MySQL database.
2. With a UML model that can be updated and customized, system design is easier to adjust to changing needs or requirements.
3. The application can help solve problems of UPT. Dersalam Kudus Health Center in the registration process by being equipped with available features, namely managing employees, polyclinics, practice schedules, patient types, patient registration, and examinations. The output produced is a registration report, practice schedule report, and patient report.
4. This system allows patients to register online, reduce manual queues, and increase the accuracy of patient data. With the integration of this technology, the health center can provide faster, more structured, and more responsive health services to the needs of the community. In addition, this system supports real-time data recording, facilitating the process of monitoring and evaluating health services. The implementation of this system reflects the importance of digital transformation in the health sector to provide a better experience for patients and medical personnel.

4.2 Advice

Suggestions that can be given based on the existence of the UPT. Dersalam Kudus Health Center Patient Registration Application Based on the Website, for its development are:

1. Adding a WhatsApp notification feature to the application to get notifications without having to always log in to the application.
2. For improvements in appearance and performance, it is hoped that a mobile application-based system can be developed.

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