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Health Information Media for Outpatient Services at Puskesmas OPI Palembang Based on a Website

Engga Salsabilah
Informatics Engineering Study Program, Faculty of Sains and Technology, Universitas Bina Darma, Palembang City, South Sumatra Province, Indonesia.
Email: enggasalsabilah22@gmail.com.

Megawaty *
Informatics Engineering Study Program, Faculty of Sains and Technology, Universitas Bina Darma, Palembang City, South Sumatra Province, Indonesia.
Corresponding Email: mega.hendiadi@gmail.com.

Fatoni
Informatics Engineering Study Program, Faculty of Sains and Technology, Universitas Bina Darma, Palembang City, South Sumatra Province, Indonesia.
Email: fatoni@binadarma.ac.id.

Rahayu Amalia
Informatics Engineering Study Program, Faculty of Sains and Technology, Universitas Bina Darma, Palembang City, South Sumatra Province, Indonesia.
Email: rahayuamalia@binadarma.ac.id.

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Abstract: The advancement of information technology has significantly influenced various aspects of life, especially in the delivery of healthcare services. Websites now play a pivotal role in providing healthcare services and information to patients, acting as a vital medium of communication. Puskesmas OPI Palembang is a healthcare institution serving the community, consisting of several departments (polyclinics), including the Maternal and Child Health Room, the Elderly Room, Special Room 1 for Respiratory Diseases, Special Room 2, General Examination Room, Dental and Oral Room, Laboratory Room, Pediatric Room, and Immunization Room. At Puskesmas OPI Palembang, a blog is currently the primary medium for disseminating health service information, alongside brochures, e-flyers, and promotional materials distributed to the local community through free health education initiatives. For outpatient health services, patient registration is still managed using paper-based records. To improve services, a website has been developed to serve as an effective platform for patients to access information about the health center, doctor schedules, polyclinics, and outpatient services, including patient registration. The website provides essential details such as the health center's location, contact information, and doctor schedules, including names, working hours, and practice days. Patients can register online by completing personal information,

complaints, preferred polyclinic, and doctor details. The website was developed following the Planning, Design, Coding, and Testing phases of the Extreme Programming methodology.

Keywords: Website; Information Media; Outpatient Services; Extreme Programming; Patient Registration.

1. Introduction

The advancement of information technology has had a significant impact on all aspects, especially in the field of healthcare. Information technology is often used in the delivery of healthcare services to patients, improving services and increasing patient satisfaction. Services are the means by which the government, private groups working with the government, or private groups themselves provide something to meet the needs and interests of the community [1]. Healthcare services refer to the assurance that the community receives optimal availability, safety, quality, benefits, affordability, and access to medicines and healthcare services [2]. This enhances patient service comfort, particularly in terms of websites. A website is a series of distinct information pages within a single domain that can be accessed by anyone via the internet [3]. A website is a page that contains information accessible when a computer is connected to the internet. With a website, people around the world can access and manage information from various sources available online [4]. OPI Palembang Health Center is a healthcare institution for the community that has several rooms (Poli), including the KIA Room, Elderly Room, Special Room 1 ISPA, General Examination Room, Dental and Oral Room, Laboratory Room, and Pediatric Room. The advancement of information plays an important role as a supporting tool for media to disseminate information about Puskesmas OPI Palembang. Media, in general, refers to communication channels. Media are tools that convey educational messages from the message sender to the message receiver [5].

Currently, there are many media created and produced by humans to convey information, ranging from offline to online media. The use of online media is very popular due to its ease of access and low cost for obtaining information [6]. The system in place at Puskesmas OPI Palembang still uses blogs as an information medium and distributes brochures, e-flyers, or promotions to the surrounding community by conducting free counseling. For outpatient health services, patient registration information still uses paper or books as registration signs for outpatient care. Therefore, patients are less effective in obtaining accurate information regarding Puskesmas information, doctor schedules, and available Poliklinik, which can impede healthcare services during outpatient registration. Outpatient services are one category of healthcare services. In short, outpatient care involves providing medical services to patients outside of an inpatient setting [1]. Information that has been modified or changed to better serve an audience is referred to as information [7]. Data that represents types of information is a source of general knowledge; data represents reality by describing events of real objects. Based on this information, the author will develop a website as a medium for health information on outpatient services at Puskesmas OPI Palembang to facilitate patients in obtaining information about Puskesmas, doctor schedules, Poliklinik, and outpatient health services such as patient registration. The information obtained by patients regarding doctor schedules includes knowing the names, hours, and days of the doctors' practices. In the patient registration section, patients can register online by completing personal identification, complaints, target Poliklinik, target doctor, etc., in the format provided on the website page. With the presence of this website as an information medium, it can be more effective in terms of time and performance for patient registration services and information dissemination. The information displayed allows patients to easily access details about the health center, as the previous system at the health center did not have a medium for online information dissemination, such as doctor and polyclinic schedules.

The software development methodology known as Extreme Programming (XP) aims to simplify, enhance adaptability, and increase the flexibility of its stages [8]. This research uses the Extreme Programming method because it includes several processes, the first being planning, which serves to identify problems, analyze requirements, and formulate a development schedule. The second process is design, during which the researcher creates database tables, user interfaces, and UML models for the proposed system design that meets the needs of the research object. UML (Unified Modeling Language) is a graphic-based language used to visualize, define, develop, and document object-oriented software systems [9]. The third process is coding, which involves implementing modeling in the user interface design. The final stage is testing, where the system is tested to identify issues that arise when the website does not function properly and to determine whether the designed system meets user needs.

2. Research Method

This research employs a descriptive approach to explain and describe the condition of the research object in relation to the identified issues, aiming for greater accuracy. To strengthen the research, the author undertakes the following stages to collect the necessary information and data:

1) Interviews
   Interviews involve data collection by directly questioning individuals involved in the study.
2) Observations
   Information is gathered through direct observation by researching or monitoring an object. Observation can be conducted either directly or indirectly. This method helps gather data and insights to understand the events occurring within the system at Puskesmas OPI Palembang.
3) Literature Study
   The author collects theoretical and conceptual data by reviewing relevant references from journal articles and books throughout the research process.
4) Extreme Programming
   Extreme Programming (XP) is a software development methodology aimed at simplifying, enhancing adaptability, and increasing the flexibility of its stages. XP emphasizes delivering high-quality products efficiently and quickly [10]. The following are the stages in XP:
   a) Planning
      The planning phase is used to analyze both the functional and non-functional aspects of the system, identifying problems, analyzing requirements, and creating a development schedule.
   b) Design
      In this phase, UML models are created to meet the needs of the research object, and database tables and user interfaces are designed.
   c) Coding
      During this phase, the system is coded based on the designs created earlier.
   d) Testing
      The system undergoes testing to identify issues, ensuring it functions properly and meets user needs. Black-box testing is applied, focusing on assessing the functionality of the application without considering the internal structure or operation. This testing method can be applied at various levels, including unit, integration, system, and acceptance testing [11].

2.1 Problem Identification

Based on the results of interviews, observations, and literature reviews, the research identified the absence of a website-based information medium at Puskesmas OPI Palembang. This lack of an online platform hinders patients from easily accessing information about the services offered by Puskesmas OPI Palembang and registering for outpatient services online. This issue constitutes the core problem addressed in this research. By leveraging advancements in information technology, the researcher aims to develop a website-based information medium to enhance the efficiency and effectiveness of patient services at Puskesmas OPI Palembang.

2.2 Need Analysis

The following needs analysis identifies the user requirements for the system to be developed, specifically the information medium for outpatient services at Puskesmas OPI Palembang:

1) Patients should be able to search for information about healthcare services and the profile of Puskesmas OPI Palembang.
2) Patients should be able to view doctor and polyclinic schedules at Puskesmas OPI Palembang.
3) Patients should be able to register for outpatient services at Puskesmas OPI Palembang online via the website.
4) Admins should be able to manage, edit, and add information displayed on the website.
5) Admins should be able to add doctor practice schedules.

2.3 Design

In the design phase, the website utilizes UML techniques, including use case diagrams, activity diagrams, and class diagrams, to create the system's design and wireframes. UML is a widely used graphical language for defining, analyzing, designing, and documenting object-oriented systems [12]. This design ensures that the system development process is structured and goal-oriented.

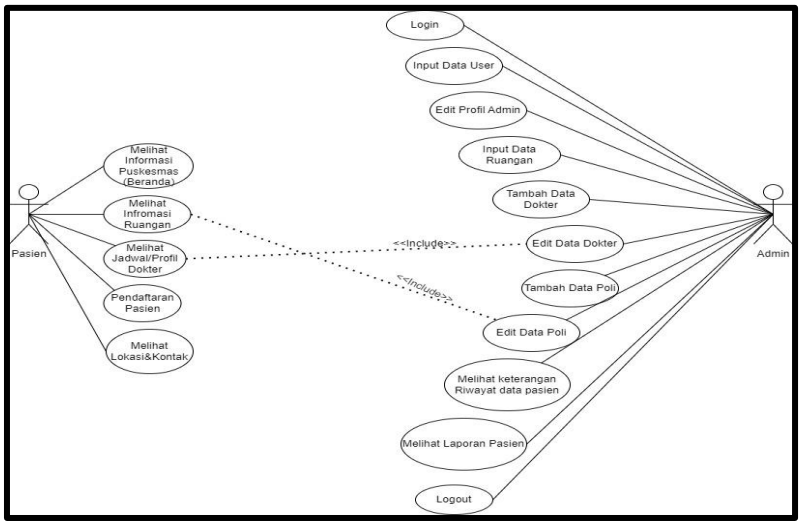


Figure 1. Use Case Diagram

Figure 1 presents a use case diagram illustrating the activities of the website system, involving two actors: patients and admins. Patients can access information such as details about Puskesmas, polyclinic schedules, and doctor availability, and can also register for services. Meanwhile, the admin manages the website's data, including inputting, editing, and viewing information related to Puskesmas OPI Palembang.

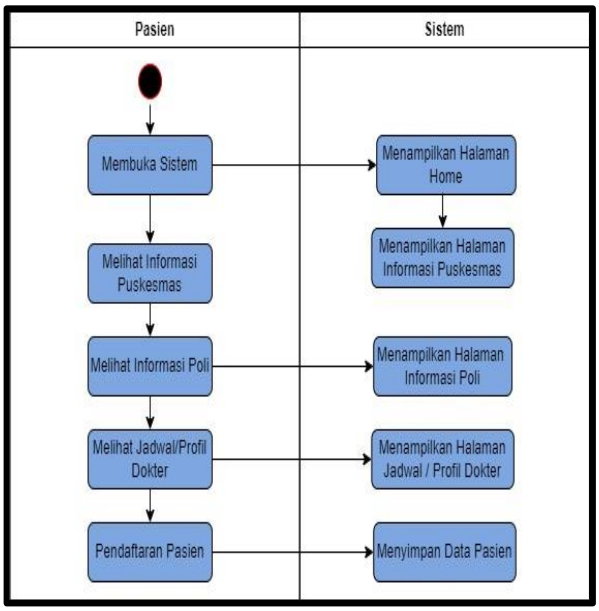


Figure 2. Activity Diagram (Patient)

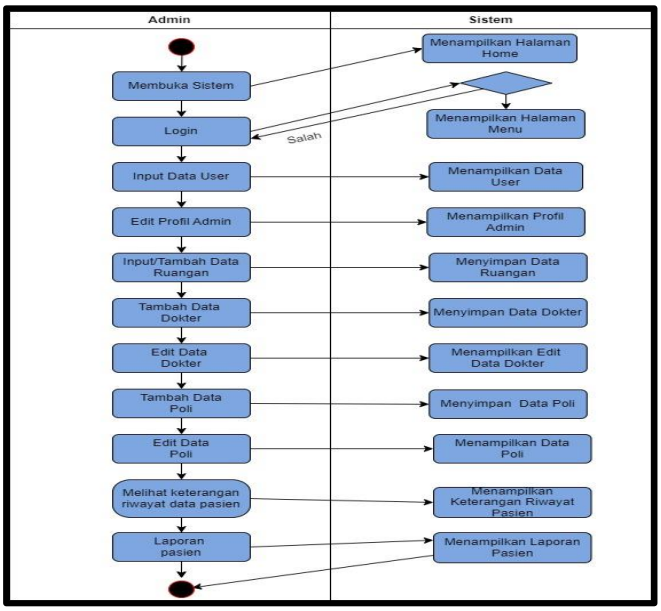


Figure 3. Activity Diagram (Admin)

Figure 2 shows an activity diagram for patients, outlining the procedures carried out by patients when using the website. This diagram provides a high-level overview of the system's workflow. Figure 3 illustrates the activity diagram for admins, depicting the actions taken by admins to manage information related to Puskesmas, patients, polyclinics, and doctors.

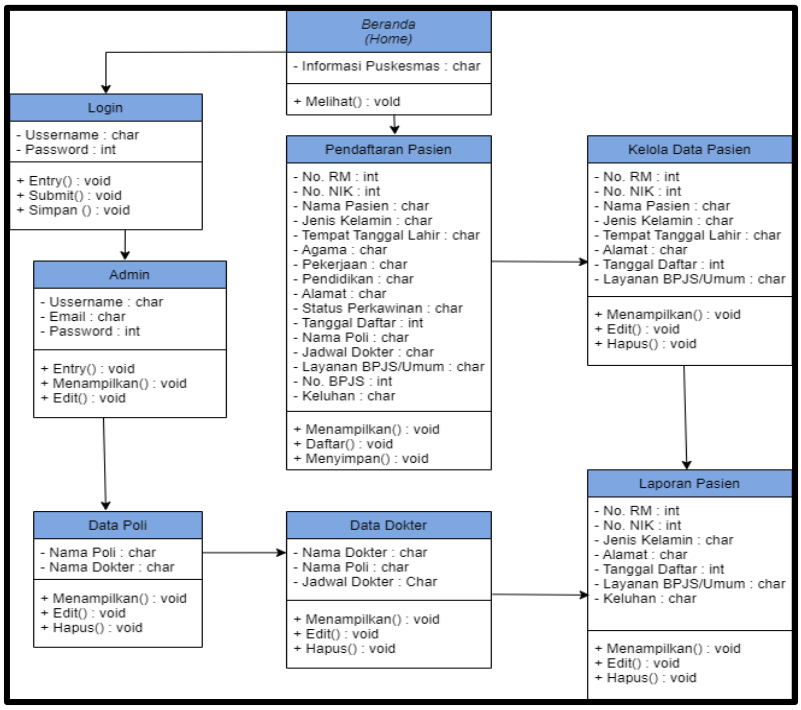


Figure 4. Class Diagram

Figure 4 displays the class diagram, which describes the relationships between the structured objects and details the content and functions of the data displayed on the website.

Figure 5. Wireframe of Home Page

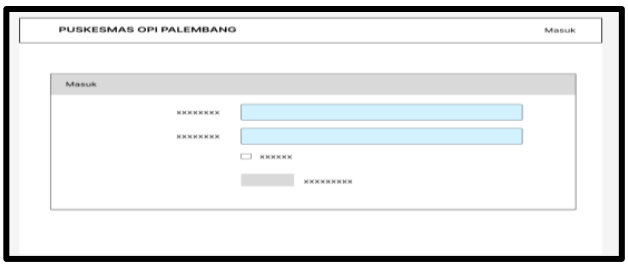


Figure 6. Admin Login Page

The homepage of the website is the initial page displayed when users first access the site. It includes various pieces of information about Puskesmas OPI Palembang, such as OPI values and direct access to the health center's social media pages (Figure 5). The admin login page is the first page visible to admins when they access the site. Admins can log in by entering their email address and password (Figure 6).

3. Result and Discussion

3.1 Results

The following presents an example of the coding process created using the Laravel framework. Laravel is an open-source PHP framework developed by Taylor Otwell. It is designed for web application development using the Model-View-Controller (MVC) pattern and is available for free [13].

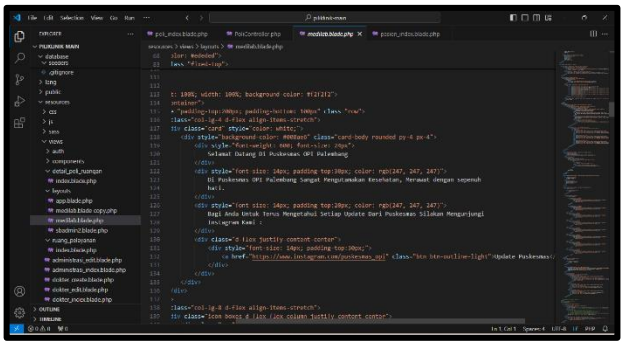


Figure 7. Main Page Coding Display

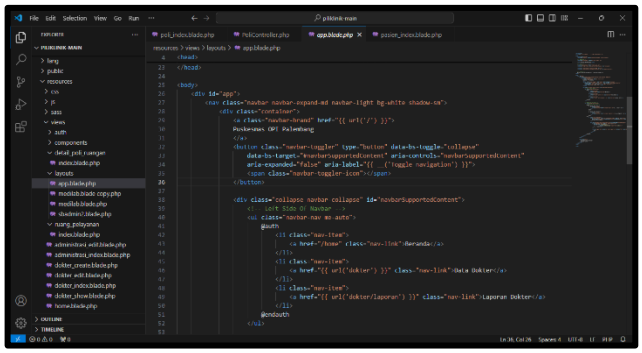
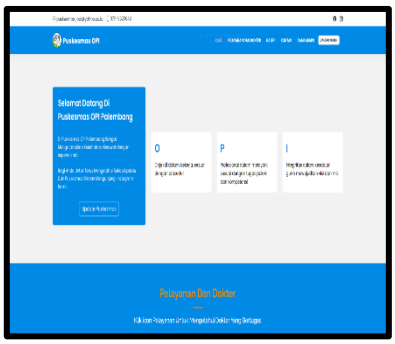
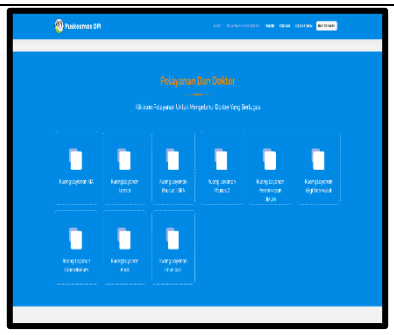
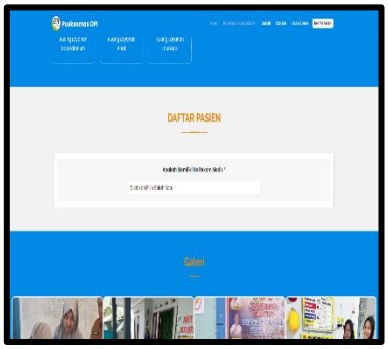
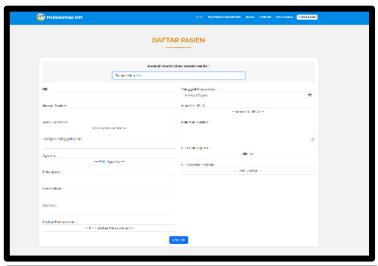
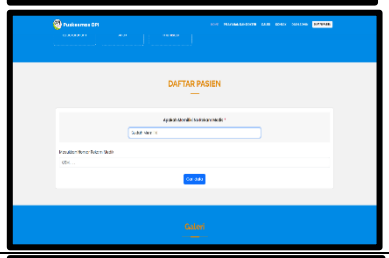
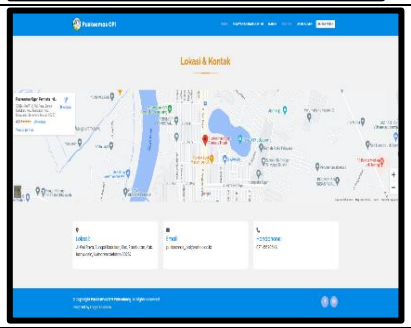


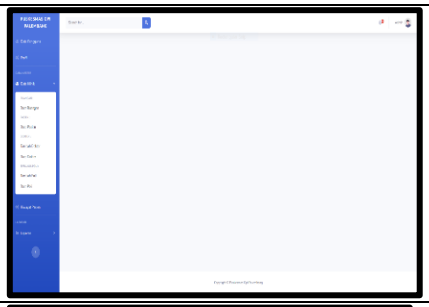
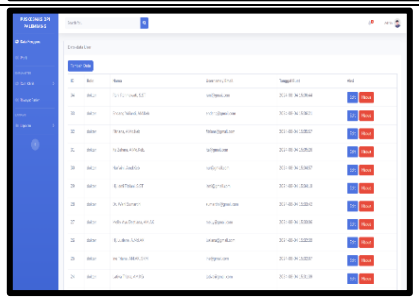
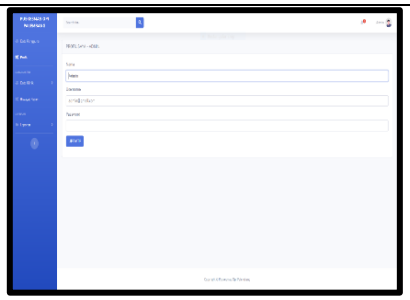
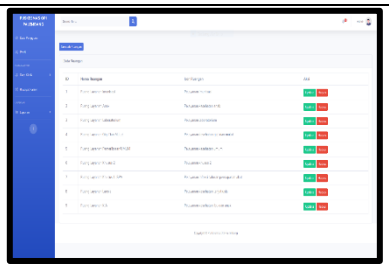
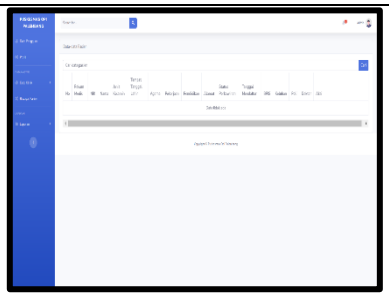
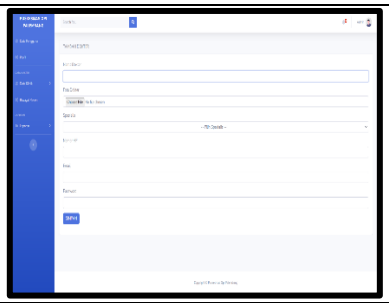
Figure 8. Patient Page Coding Display

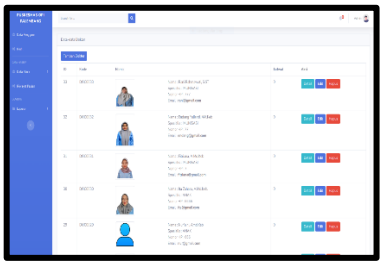
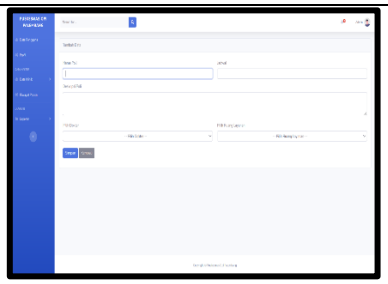
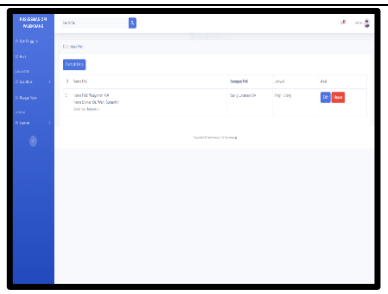
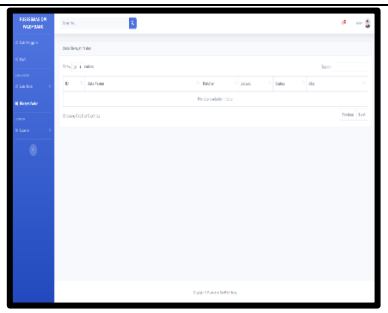
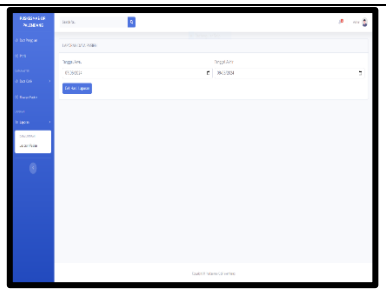
Figure 7 illustrates the source code layout for the main page, as displayed in Figure 7, which is visible to users upon their first visit to the website. The source code includes information about Puskesmas, displayed on the main page, such as social media links like Instagram, along with the layout of text, elements, and images. Figure 8 shows an example of the source code for the admin page, which functions to display various layouts within the admin section.

Table 1. Black Box Testing

No	Function	Testing Methods	Expected results	Picture	Test results
1	Home Page	When patients access the website for the first time, it will display the home page, which shows information about Puskesmas OPI Palembang.	The home page Successfully opens and displays information about Puskesmas OPI Palembang.		Successful
2	Services & Doctors	Patients can view the rooms (polyclinics) and, upon clicking, will see the names of the doctors, nurses, and midwives on duty.	Displays information about the rooms (polyclinics) and the names of the doctors, nurses, and midwives.		Successful

3	Patient registration	Patients register online by filling out the mandatory fields on the form.	The registration process is Successfully completed after the patient fills out the patient information.	  	Successful
4	Gallery	Patients can view images of activities conducted by Puskesmas OPI Palembang.	The page displays images of activities conducted by Puskesmas OPI Palembang.		Successful
5	Location & Contact	Patients explore the location of Puskesmas OPI and view the contact information provided on the website page.	The location & contact page Successfully displays the location and contact information.		Successful
6	Admin Login	The admin enters the email address and password to log in.	The admin can log in and access the subsequent pages.		Successful
7	Admin dashboard	Displays the initial page, which is the	The admin dashboard page		

		admin dashboard, featuring several functions and menus.	can display menus and features.		Successful
8	User data	Add and display user data to access the admin page.	Successfully adds user data and displays user data.		Successful
9	Admin profile	The admin can update the admin profile, such as changing the password.	Successfully updated the admin profile.		Successful
10	Room data	The admin adds room data to be displayed on the rooms and doctors page.	Successfully added and displayed room data.		Successful
11	PatientData	Displays patient data after patient registration.	Successfully displayed patient data.		Successful
12	Add doctor	The admin can add doctor data and then save it.	Successfully saved the added doctor data.		Successful

13	Doctor Data	Displays the doctor data that has been added.	Displays doctor data.		Successful
14	Add Polyclinic	The admin adds polyclinic data to be displayed on the patient registration form.	Successfully saved the added polyclinic data.		Successful
15	Polyclinic Data	Displays polyclinic data that can be edited and deleted.	Successfully displayed polyclinic data, which can be edited and deleted.		Successful
16	Patient history	The administrator performs actions on patient data that has undergone procedures by filling in the diagnosis.	Successfully saved the action and displayed the patient history.		Successful
17	Report	Displays the final patient report and can be searched by the desired date.	Can Successfully display and search the final report by the desired date.		Successful

The development of outpatient service information media at the OPI Palembang Health Center in the form of a Website is an effective solution to improve access and distribution of outpatient services. Patients can access important information such as doctor schedules, polyclinic details, and online patient registration through the website. By using the Extreme Programming methodology, the developed system is a flexible and superior

platform that is suitable for patients and administrators. This can improve patient experience and improve administrative work.

3.2 Discussion

The study has developed a health information-based website for outpatient services at the OPI Palembang Health Center. The application was created to make it easier for patients to obtain information related to health services at the OPI Palembang Health Center, such as doctor schedules, polyclinic information, and online patient registration. This website was developed based on the Extreme Programming (XP) development process designed to reduce assumptions and increase iteration. This XP approach allows the development team to work methodically and structured in each phase of development to ensure that the final product is in accordance with user requests, both patients themselves and the Puskesmas admin. The following is the website development process which is divided into several main stages: planning, design, coding, and testing.

The purpose of developing the website which is mainly centered on designing an easy-to-use platform for patients who want to utilize health information is derived at the planning stage. Stakeholder interviews and observations of existing processes at the Puskesmas are used to collect system requirements. At this stage, project schedule planning and allocation of required resources are also carried out. During the design phase, the development team builds UML diagrams to model the system structure and functional levels, and UML diagrams such as use case diagrams, action diagrams, and elegance diagrams are some of the UML diagrams. These design diagrams act as a roadmap and also maintain consistency in development and make the website user-friendly for patients with varying levels of digital experience. Coding: The system was developed using Laravel, an open-source PHP framework based on MVC (model view controller) architecture. We decided to use this framework because of its flexibility and scalability that allows building a robust and dynamic website. At this stage, core functionalities such as registered user (patient) schedules for doctors and information about polyclinics were well integrated and ensured smooth operation of the website across all types of devices.

We tested the application to ensure everything was working properly. Black-box testing was conducted to measure the functionality of this website from a user's perspective without accessing the internal details of the system. Testing was conducted for each page and feature so that all components including patient registration, doctor schedules, information displays, etc., were functioning properly. All tests against core functionalities were passed, and met the set requirements. This research has successfully developed a health information-based website for the OPI Palembang Health Center and obtained trial results that show that the website can be a more efficient, useful, and practical system for users who need information and to register outpatient care through the website. Extreme Programming methodology is used in the development, which means the website is flexible and can adapt to changing needs that arise during development. For patients, the web is easily accessible, and for the Health Center, the online information system is more efficient because it reduces the use of paper and manual input.

4. Related Work

Several previous studies have developed website-based systems in the health sector that focus on improving service efficiency, reducing the use of paper-based media, and increasing patient access to the information they need. These studies provide a strong basis for developing a similar system at the OPI Health Center in Palembang. One relevant study was conducted by Muharam & Persada (2020), who developed a website as a medium for information and marketing of agricultural and livestock products in Sumberejo Village [9]. Although this study focused more on product marketing, the results of the study showed that websites can expand the reach of information and provide convenience for the public in accessing information quickly and efficiently. Similar principles can be applied in the health sector, where websites are used to disseminate medical information and health services to patients more effectively.

Andriyan *et al.* (2020) developed a website to improve the image and distribution of information at SMK Dewi Sartika Tangerang. This website helps facilitate the student registration process and introduces the school to the public [14]. Although this study focuses on the world of education, the principles of web-based information management applied can be adapted to the management of health service information at the OPI Health Center in Palembang. This allows for more efficient and structured management of medical information and patient registration. Nurlailah & Nova Wardani (2023) developed a website to promote souvenirs from Pagaralam City [15]. This study shows that websites can save costs and time and expand market reach. The application of similar ideas to health services allows patients to access information related to medical services,

doctor schedules, and patient registration online, which can improve operational efficiency at the OPI Palembang Health Center.

Amalia & Huda (2020) developed a website-based health service information system at the Smart Medica Clinic. This study aims to speed up the administration process and make it easier for patients to access medical services [1]. Their findings show that a web-based system can improve patient convenience in obtaining medical services. Although this study focuses on clinics, similar concepts can be applied to the OPI Palembang Health Center, which offers more types of health services and serves a larger number of patients. Research by Madyaningrum *et al*. (2018) discusses the factors that influence the use of outpatient services, especially among the elderly in Indonesia. This study highlights that the availability of clear and easily accessible information plays an important role in increasing the utilization of outpatient services [17]. In this case, the implementation of a website that provides easily accessible information about doctor schedules and other health services can support patients in making more informed decisions regarding their medical needs. Idris (2023) research is also relevant, especially related to the development of an efficient information system for outpatient services [16]. This study shows the need to improve the accessibility of outpatient services in Indonesia, including at Puskesmas. By implementing a website-based system, Puskesmas OPI Palembang can make it easier for patients to check doctor schedules and register online, thereby increasing the reach and quality of services.

Gong *et al* (2019) research shows that the implementation of information and communication technology (ICT) can improve the quality of health services [18]. At Puskesmas OPI Palembang, the use of a website can speed up the administration process, provide easier access for patients to medical information, and increase transparency in service delivery. This is in line with the findings of He *et al*. (2019), which emphasizes that outpatient services play an important role as a starting point for patients in the health care system [19]. Various studies have shown that the implementation of a website-based system in the health sector has great potential to improve operational efficiency and service quality. Websites can reduce dependence on paper-based media, while improving the patient experience in accessing health information and services. This study develops a similar application for outpatient services at the OPI Palembang Health Center, which serves more patients and offers more types of services. The implementation of web-based technology in this facility is expected to improve the quality of service and accelerate existing administrative processes.

5. Conclusion and Recommendations

Based on the research results and discussions that have been presented, it can be concluded that this study has succeeded in developing and producing a website-based health information media system for outpatient services at the OPI Palembang Health Center. This website facilitates patients in accessing health service information and allows patient registration online. Compared to the previous system that still uses paper-based registration and requires patients to come directly to the Health Center, this website offers greater convenience. Patients can now register online from home and see the doctor's schedule via the website without having to ask or check information directly at the location.

With the existence of website-based health information media for outpatient services at the OPI Palembang Health Center, there are several recommendations for further research. It is hoped that this system can be used as a reference for the development of further studies in the same field. To improve accessibility and user convenience, this system should be further developed into a mobile application. In addition, features that do not yet exist, such as email notifications for patients who have completed registration, can be added to increase user satisfaction. The researcher also suggests that special features for doctors, which allow them to access and view data and information related to patients and their schedules, can be considered in future system development.

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