Design and Construction of a Web-Based Outpatient Data Management Information System (Case Study: UPTD Puskesmas Cikampek)

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Abstract

The focus of this research is the design and development of an information system to manage outpatient data at the UPTD Cikampek Health Center which operates via the internet. The purpose of this system is to overcome the problem of inefficient manual recording at the cashier and to improve efficiency and accuracy in managing patient data. A prototype model is used in software development. This model includes steps such as needs analysis, system design, implementation, and testing. The results of this study are in the form of a web-based information system that includes login features, patient data management, payments, reports, and transaction history. It is expected that this system can help exchange information online throughout the scope of the Health Center, accelerate the distribution of reports, and facilitate the management of patient data. Therefore, this study offers an innovative and practical solution to managing health data at first-level health care facilities.

Keywords: *Information System, Outpatient, Web, Prototype*

1. Introduction

Nowadays, many activities are getting easier to do thanks to the support of Information Systems. This is due to the ease and efficiency it offers. Information Systems themselves can be defined as a collection of subsystems that are integrated with each other and work together to solve certain problems [1]. This process involves processing data using a computer, resulting in information that has added value and is useful for its users [2]. Information systems are used for various needs, such as sharing information, storing data in a database, and others [3]. This system can be web-based, desktop, or mobile, each has advantages and disadvantages that are adjusted to user needs. Therefore, there is no doubt that the use of information systems in the current era is very helpful and provides many benefits [4]. The use of web-based information systems is one form of technology use in the health sector. The advantage of a web-based system lies in its ease of use, because it is lightweight to use and can be accessed quickly via a browser using an internet or intranet connection to the server [5].

The Community Health Center is a workplace that needs to utilize information systems to support the process of exchanging and storing patient data [6]. As a first-level health service facility, the Community Health Center focuses on promotive and preventive efforts in providing health services, both to individuals and the community. The goal is to achieve an optimal level of public health in the area of its responsibility [7]. The Cikampek Community Health Center, located in South Cikampek, is a government-owned health service facility with very complete services. To support the service process, it is necessary to develop an information system that can facilitate the management of patient databases.

Currently, payment recording at the cashier is still done manually using a ledger. The patient data that has been recorded is then summarized and transferred to Excel format to be used as a daily report, which is then submitted to the treasurer. This process is inefficient and time-consuming. Meanwhile, the administration and medical record (MR) sections have used an information system. The problem that arises is the uneven use of the information system in this Health Center, so it is not optimal as a tool for exchanging information online throughout the scope of the Health Center's work.

Thus, the purpose of this study is to find a solution to the above problems, namely by creating an information system that meets all the needs of employees at the Cikampek Health Center.

2. Research Methodology

To obtain accurate data in this study, several methods will be used, including:

2.1. Method of Collecting Data

The data collection methods used are:

1. Observation
   To collect the data needed in this study, direct observation was conducted at the Cikampek Health Center. Through this method, the researcher observed and helped the health center employees to understand the workflow and systems implemented in the administration and cashier sections.
2. Interview
   In this method, researchers interviewed administrative officers and cashiers to understand how they recorded and archived data on patients who had made payments, as well as all activities related to the research being conducted.
3. Literature Review
   In this method, researchers collect data by referring to various relevant references, such as books, journals, and the latest and previous articles found on the internet. In addition, researchers also utilize data available at the Cikampek Health Center.

2.2. Software Development Methods

The method used in this software development uses a prototype model. According to Ogedebe and Peter Jacob, in software development, prototyping is the process of creating a working model of a system that functions as an early version of the software being developed. This prototype is usually made for demonstration purposes or as an initial step in the development process, before proceeding to further development or mass production [8]. This prototype method is also often used to describe the design of the system to be created [9]. Thus, this prototype model functions as a tool that provides an overview to developers and potential users regarding how the system will function as a whole. This process is used to produce a prototype known as prototyping [10]. The following are the stages of the prototype model, including:

1. Needs Analysis
   At this stage, the researcher observed the system or flow of patient transactions in the administration and cashier sections. Because the system at the cashier is still manual, namely using a ledger for recording, the researcher checked the data recorded in the book. Furthermore, the researcher conducted observations to identify existing problems, in order to design solutions in the form of information systems. The researcher also conducted interviews with Cikampek Health Center employees to understand user needs.
2. Design
   After understanding the flow, needs, and planning required, researchers at this stage describe what the system will be built like and how it will work. To describe the system, researchers use ERD and LRS to design the database, and UML for software modeling, such as activity diagrams, use case diagrams, class diagrams, and sequence diagrams. In addition, researchers also use prototype designs to help identify errors and deficiencies in the features to be created.
3. Implementation and Unit Testing
   After creating a system overview using diagrams and prototypes, researchers continued with implementation using patient output documents. Researchers also conducted unit testing using the black box testing method to ensure the system functions properly and can be used without any problems.

3. Results and Discussion

The result of this study is the design of a web-based outpatient data management information system at the UPTD Cikampek Health Center. This study produces a website page design that includes a login page, a payment page at the cashier, a payment form page, a payment note print page, a payment history page, an action payment history add page, a KIR payment history page, an KIR payment history add page, a KIR letter download page, a report page and a report download page.

3.1. Software Requirements Analysis

1. Analysis Stages
   The study of the Design and Construction of a Web-Based Outpatient Data Management Information System at the UPTD Cikampek Health Center has 3 users who interact with each other in the system environment, namely Administration, Polyclinic Officers and Cashiers. The three users have different characteristics of interaction with the system and have different information needs. The following are the specifications of the system requirements:
   a. Administration Page
      1) Login Page
      2) Patient Registration Page
      3) Patient Data Check Page
      4) Patient Data Management Page
      5) Polyclinic Patient Input Page
      6) Polyclinic Patient Queue Printing Page
      7) Patient Service Management Page
      8) Report Management Page

b. Polyclinic Officer Page
  1) Login Page
  2) Polyclinic Patient Queue Viewing Page
  3) Patient Medical Record Management Page
  4) Patient Medication Input Page
  5) Patient Examination Input Page
  6) Action Letter Input Page
  7) Referral Letter Input Page
  8) Illness KIR Letter Input Page
  9) Manage Report Page

c. Cashier Page
  1) Login Page
  2) Patient Payment Management Page
  3) Patient Payment Confirmation Page
  4) Patient Letter Detail View Page
  5) Print Proof of Payment Page
  6) Patient Payment History Management Page
  7) Patient Payment Input Page
  8) Payment Report Management Page

2. Use Case Diagram
  a. Administration Page Use Case Diagram

Figure 1: Administration Page Use Case Diagram

  b. Use Case Diagram of Polyclinic Officer Page

Figure 2: Use Case Diagram of Polyclinic Officer Page

c.　Cashier Page Use Case Diagram

Figure 3: Cashier Page Use Case Diagram
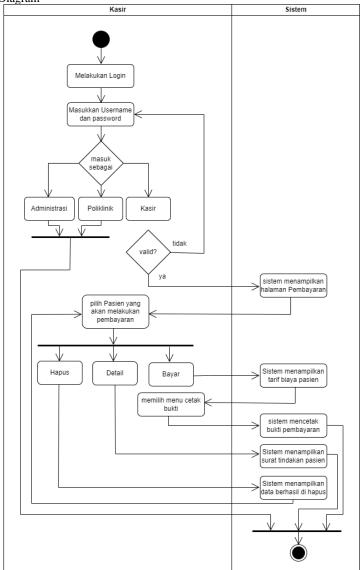
3.　Activity Diagram
　　a.　Patient Payment Activity Diagram

Figure 4: Patient Payment Activity Diagram
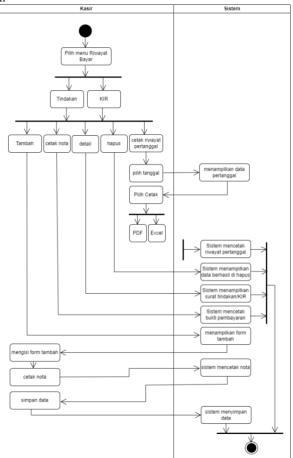
b.   Payment History Activity Diagram

Figure 5: Payment History Activity Diagram
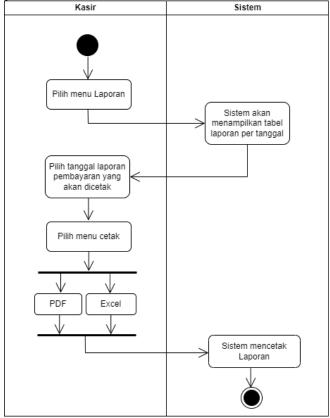
c.   Activity Diagram Payment Report

Figure 6: Activity Diagram Payment Report

4. Design
   a. Entity Relationship Diagram (ERD)
      A diagram that describes the relationship between entities and their attributes. Here is the ERD from the Puskesmas website:
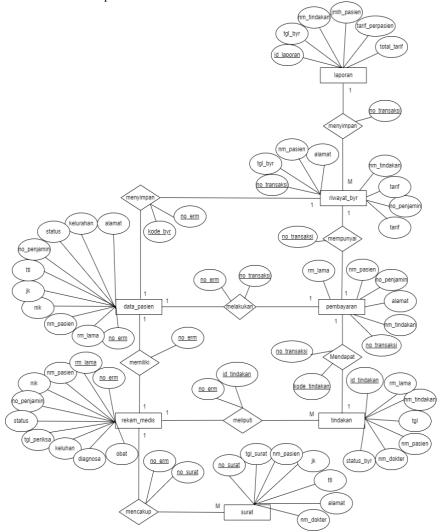

Figure 7: Entity Relationship Diagram (ERD)

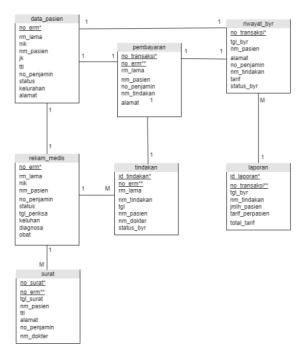   b. Logical Record Structure (LRS)

Figure 8: Logical Record Structure (LRS)

3.2. User Interface

The following is the interface design when the user opens the health center website:
1. Login Page
    The first time you open the website, a display like this will appear, then we enter the username, password and log in as (admin, polyclinic officer or cashier). In this discussion, we will log in as a cashier.

Figure 9: Login Page

2. Patient Payment Data Page
    The following is a display of patient payment data, we can search for patient data that has paid or not through the search data No.eRM/Old, Based on Name or Action.
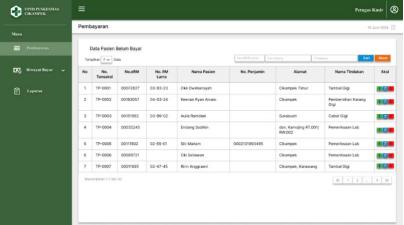

Figure 10: Patient Payment Data Page

3. Payment Note Print Page
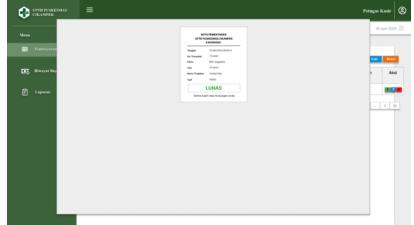   The following is a printed payment note page for patients who have paid in full.

Figure 11: Payment Note Print Page

4. Action Pay History Page
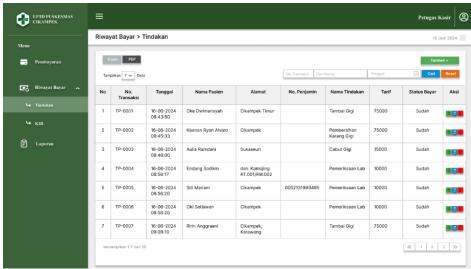   The following displays the Payment History data for patient actions.

Figure 12: Action Pay History Page

5. KIR Payment History Page
   The following is a display of the KIR (Health Certificate) Payment History page.
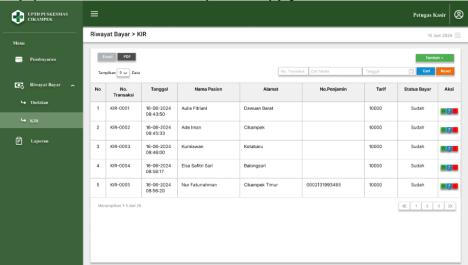

Figure 13: KIR Payment History Page

6. KIR Letter Download Page
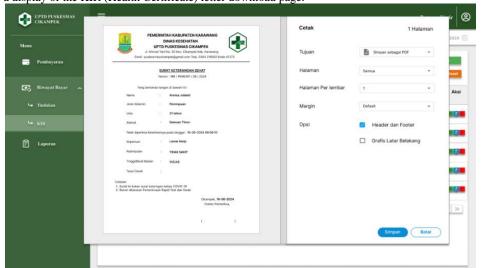   The following is a display of the KIR (Health Certificate) letter download page.

Figure 14: KIR Letter Download Page
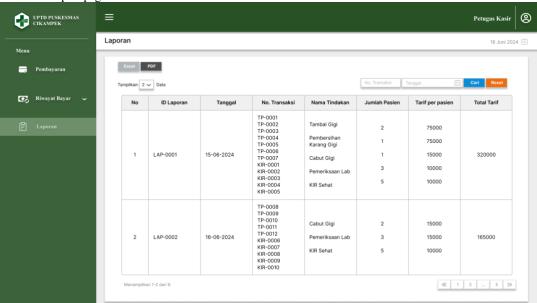
7. Report Page
   Here is a view of the report page.

Figure 15: Report Page

4. Conclusion

This study discusses the design of a web-based outpatient data management information system for the UPTD Cikampek Health Center. This system is designed to improve efficiency and accuracy in patient data management, especially in the cashier section which was previously done manually. By using a prototype-based software development method, the researcher designed a system that includes various interface pages, such as login pages, payments, reports, and payment history, which are adjusted to user needs, namely administration, polyclinic officers, and cashiers.

The implementation of this system is expected to facilitate the process of managing patient data, accelerate the presentation of reports, and support online information exchange throughout the scope of the Health Center. Thus, this information system provides a practical and innovative solution to data management problems at the Cikampek Health Center.

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