

Article

Design and Development of a Web-Based Medical Record Retention Information System at Polyclinic X Jember Regency

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Abstract: Medical record retention activities that have been carried out at Polyclinic X Jember Regency have encountered obstacles in sorting files that are still manual, starting with the officer checking the month and year of the patient's last visit to the Polyclinic's SIM Clinic, then taking several medical records on the storage rack and recording the medical record number for sorting. There are quite a lot of files on the storage rack, making officers have to sort the files one by one. The type of research used R&D with the Waterfall system development method, namely Requirement Definition, System and Software Design, Implementation and Unit Testing, Integration and System Testing, also Operation and Maintenance. Data collection techniques using interviews and observations with 2 respondents, namely the head of polyclinic and medical records officers. This study aims to design and create a web-based medical record retention information system by minimizing errors in sorting medical record files and facilitating the performance of medical record officers in the filing section. The result of this research is a web-based medical record retention information system created using the PHP programming language.

Keywords: Design, development, information system, retention, medical record



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1. Introduction

The development and advancement of technology in the current era of information digitization is considered to have the greatest influence, one of which is technology in the health sector. Health technology that has developed can make it easier for patients to get health services. In addition, health technology can also make it easier for doctors and medical personnel to be able to reach patients over long distances. One of the current uses of health technology is Electronic Medical Records (RME). The *World Health Record* (WHO) states that the implementation of electronic medical records is increasing where over the past 5 years it has reached a 46% global increase [1]. However, an article said that the use of electronic medical records in the United States and a number of other countries is still very small, with about 15% - 20% of doctors using the system and about 20% - 50% of hospitals [2]. This is due to the high investment cost of electronic medical records compared to manual medical records. But the development of this technology makes the field of health services, especially medical record management, more effective and efficient.

Medical Record is a record containing data on patient identity, examination, treatment, actions, and other services that have been provided to patients [3]. Patient medical records are an important responsibility of every service provider, one of which is the medical record officer because medical records are confidential because not just anyone can read someone's clinical data information [4]. Most health services currently organize medical records in the form of paper medical records, which are easily lost, damaged, and do not support clinical decision making [5].

Medical Records are divided into two types, namely active medical records and inactive medical records. When medical records are inactive, it is necessary to carry out retention based on the period or time determined according to the rules and policies of the health service facility. Retention or shrinkage of medical records is an effort made by health care facilities to reduce the accumulation of medical records on storage shelves [6].

The results of the researcher's preliminary study by conducting interviews and observations at the research location found that the retention implementation process that had been carried out was twice. The first retention was around 2011 and the second in 2018. The files retained in 2018 were also not many because they adjusted the graduation year of students and employees who had died. The process of implementing retention that has been carried out gets obstacles when sorting active files into inactive ones. Medical record officers still have to record the patient's last visit on paper manually from the clinic system then take the medical record to be retired on the storage rack and then record the medical record number one by one to sort the list of inactive medical records.

Previous research designed and created an outpatient medical record retention information system because the retention activities carried out were still manual so that the possibility of risk in the activities and processing of retention data did not run well [7]. While similar research makes the design of an inpatient medical record retention information system whose results are expected to be able to provide information about patient data that will be retained with a faster and more accurate data presentation using an optimal computerized system [8].

Based on this description, the main problem is that there is no control system that makes it easier for medical record officers to process medical records that will be retained in a computerized manner. If a medical record retention information system is available, it is hoped that it can make the performance of medical record officers in carrying out retention activities more effective and time efficient. So it is important to research related to the design and creation of this web-based medical record retention information system to be able to manage inactive medical record files so that computerized retention can be carried out.

2. Materials and Methods

The research method used is the descriptive research method or also called the analytical research method. The system development method used is the waterfall model. In this descriptive research method, literature studies and observations are carried out on problems related to research.

2.1. Type of Research

The type of research used in this study is *Research and Development* (R&D). R&D is a type of research used to produce a new product which is then tested for effectiveness [9]. The system development method used is waterfall, where this method is described by a form of systematic and sequential approach to software development [10]. The unit of analysis is the unit studied in the form of individuals, groups, objects, or individual or group activities that are the subject of research [11], so that in this study the research subject consisted of 1 medical record officer and the head of the polyclinic and the object was the implementation of medical record file retention in the polyclinic filing unit.

Data collection used by researchers is the interview and observation method. The interview method is one type of data collection by asking several questions in a structured or unstructured manner to obtain information about the object of research [12]. This interview was conducted with 1 medical record officer who was assisted by the opinion of the head of the clinic. The observation method is the process of systematic observation of human activities that take place continuously to produce a fact [13]. Observation in this study was carried out by directly observing the conditions and situations in the polyclinic to

find out the functional and non-functional needs in designing and creating a web-based medical record retention information system.

Research instruments are tools of data collection that are prepared based on instrument development procedures and research needs to collect research data [14]. The research instrument guidelines used are interviews containing a list of questions and observations in the form of check-lists on retention to make observations in accordance with the research objectives. The resulting research instrument is used as proof of information obtained during data collection. The following is a picture of the stages of this research.

2.2. Research Framework

The picture below (figure 1) is the research framework used in this study:

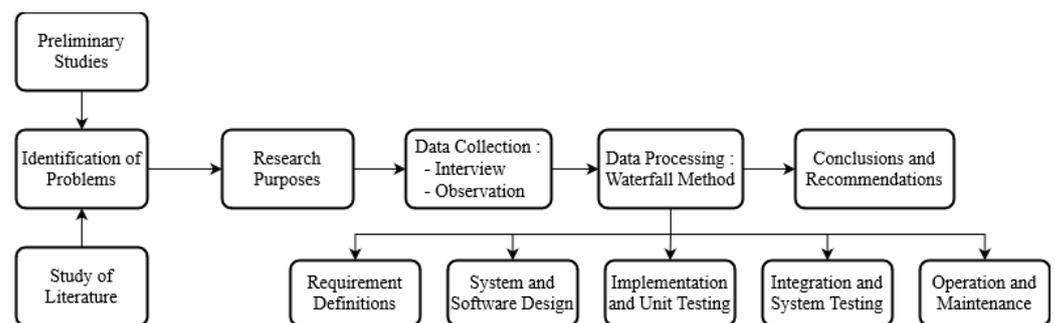


Figure 1. Research Framework

Description :

1. Preliminary Studies

At this stage, researchers make observations in the field directly to obtain evidence of the conditions and facts that really occur in the field.

2. Study of Literature

Researchers collect literature materials to obtain theories by paying attention to information that is relevant and in accordance with the researcher's topic so that researchers have a broad view of the theory related to the problem being studied.

3. Identification of Problems

The problems that have been obtained by the researcher are identified to find problems in accordance with the topics to be discussed by the researcher.

4. Research Purposes

Research objectives are determined to provide an achievement of what will be produced from the research.

5. Data Collection

Data collection used by researchers in the form of interviews and observations where the data collected can produce information about the conditions and facts that exist in the field related to the researcher's topic, namely the design and creation of a medical record retention information system.

6. Data Processing

The next stage researchers process the data that has been collected by utilizing the waterfall system development method. The use of the waterfall method is quite widely used by developers because this method can design systems in an organized and complete manner at each stage before proceeding to the next stage [15]. The waterfall method stages are as follows :

a. *Requirement Definitions*

Researchers collect the needs needed to design and create a website-based medical record retention information system.

b. *System and Software Design*

Researchers conducted a design stage to design a system based on the results of the needs analysis in the previous stage by creating a system flowchart design, context diagram, DFD, ERD, and user interface.

c. *Implementation and Unit Testing*

The coding stage is carried out after the researcher has designed the previous system design so that a series of information systems will be produced in such a way as to meet the needs of the system.

d. *Integration and System Testing*

The information system that has been created will be tested to determine the extent to which the system has been successfully created and what deficiencies and weaknesses are found in the system, so that researchers can improve the system to be even better.

e. *Operation and Maintenance*

The last stage of the waterfall method is carried out to maintain and maintain the system continuously for a long time. System maintenance is carried out so that no errors occur when operating the medical record retention information system.

3. Results and Discussion

A. Requirement Definitions

The initial stage of the waterfall method is to analyze software requirements. The function of this stage is to collect the necessary requirements of the software to be built so as to produce a form of software requirements specification [16]. The results of the analysis from interviews and observations by researchers at the research location, the system requirements needed later are access by the user medical record officer and there is a menu for processing retention data, medical record data, visit data, destruction data, minutes of destruction and SOPs used.

B. System and Software Design

This system design stage represents the results of the needs analysis which are then designed into a system design to be implemented into a program at a later stage [17]. The design of a web-based medical record retention information system by researchers has been described as follows.

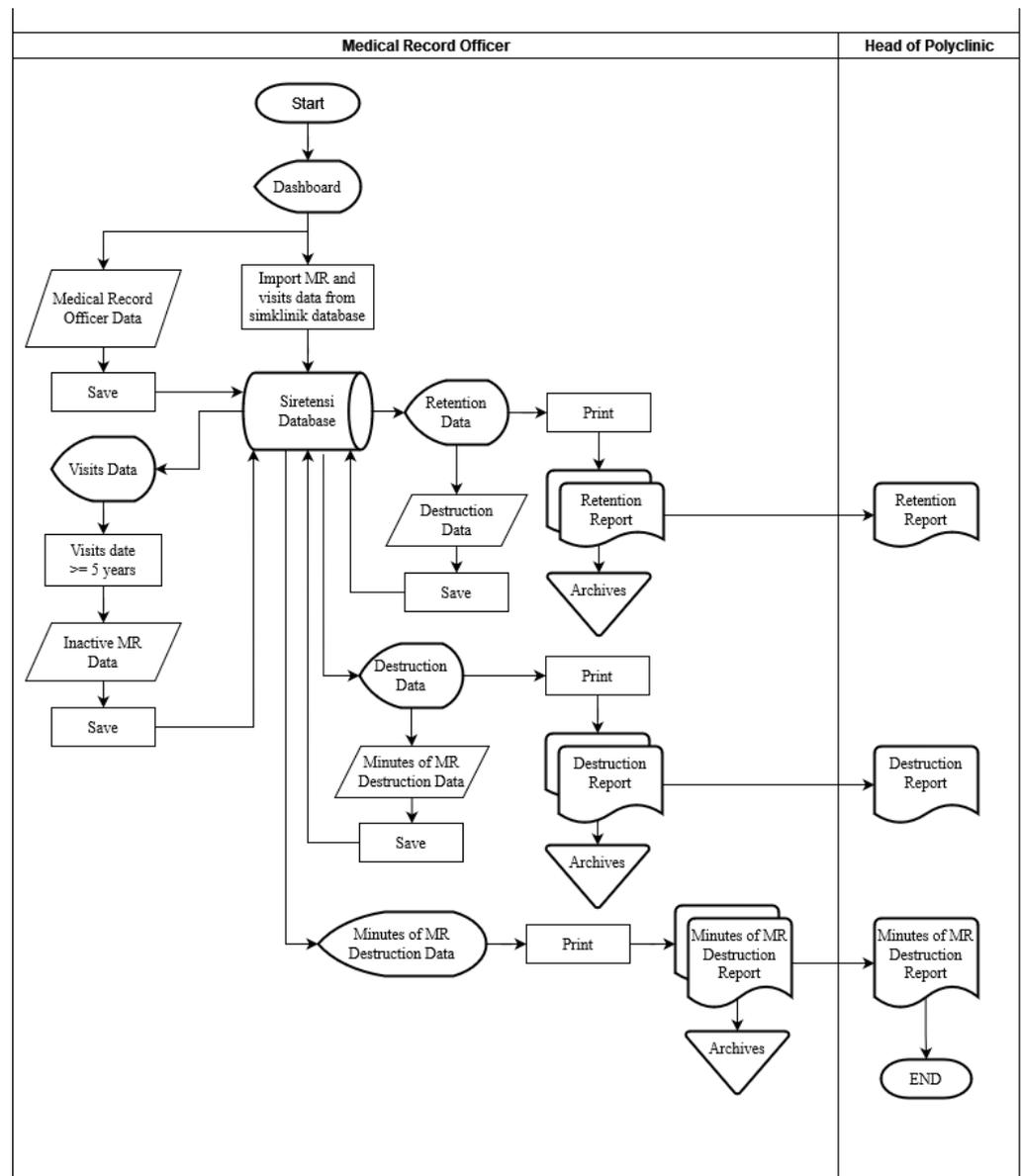


Figure 2. Flowchart of Retention Information System

For context data flow diagrams as follows:

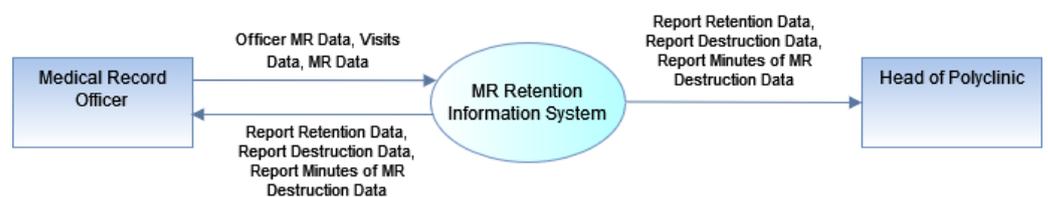


Figure 3. Context Diagram Retention Information System

Context diagram is a diagram consisting of a process and several entities to describe the scope of an information system [18]. In the context diagram of the web-based medical record retention information system above, there is a retention information system process and the entities involved, namely medical record officers and heads of polyclinics.

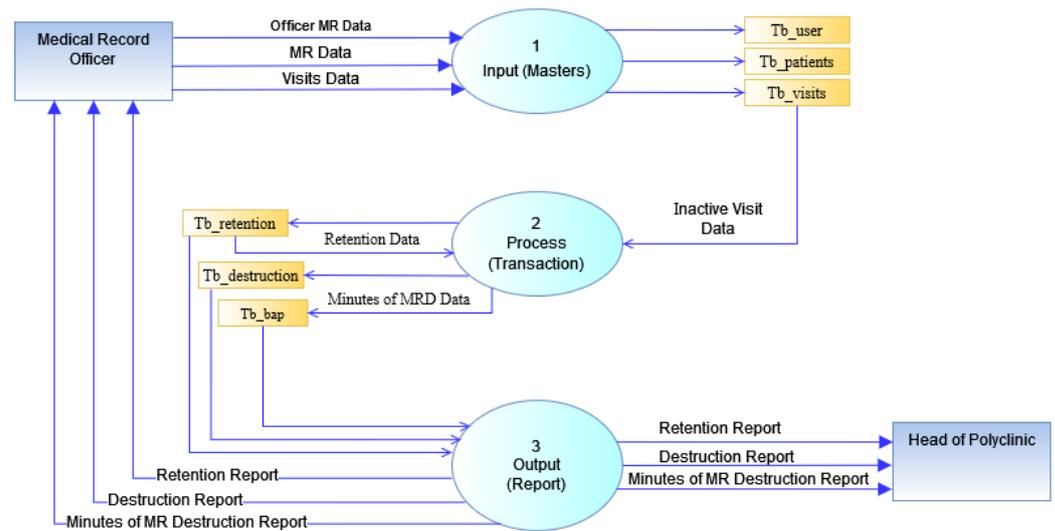


Figure 4. DFD Level 1 (Diagram Overview)

Data flow diagram is a graphical visualization of how the system operates from a data flow through the information system [19]. There are 3 processes, namely Input (Master), Process (Transaction), and Output (Report). The Input (Master) process describes medical record officers inputting and processing data in the master process and then storing it in each database table. The Transaction Process describes the flow of transactions from the input process to do data processing. The Output (Report) process produces a printed list of reports from data that has been processed.

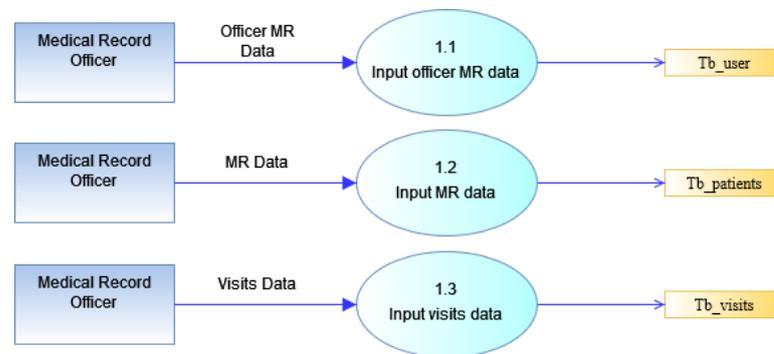


Figure 4. DFD Level 2 (input retention process)

The Input Process (Master) above clearly illustrates the flow of how medical record officer data, medical record data, and visit data are inputted and stored into a predetermined database.

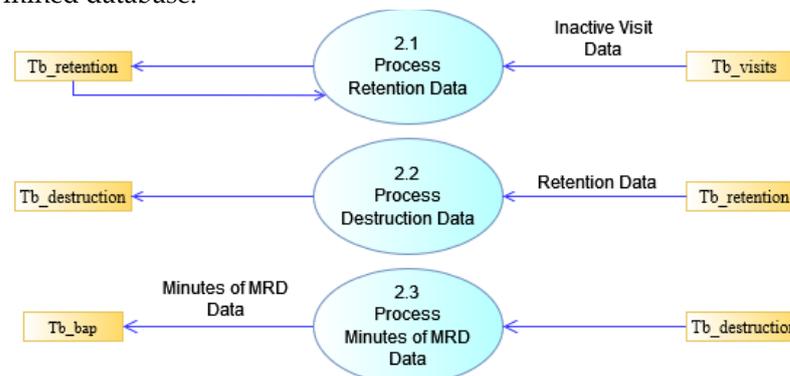


Figure 5. DFD Level 2 (retention process)

The Transaction Process is clearly described related to the process of retention, destruction, and minutes of destruction processed from each database to produce a data processing formed by the user.

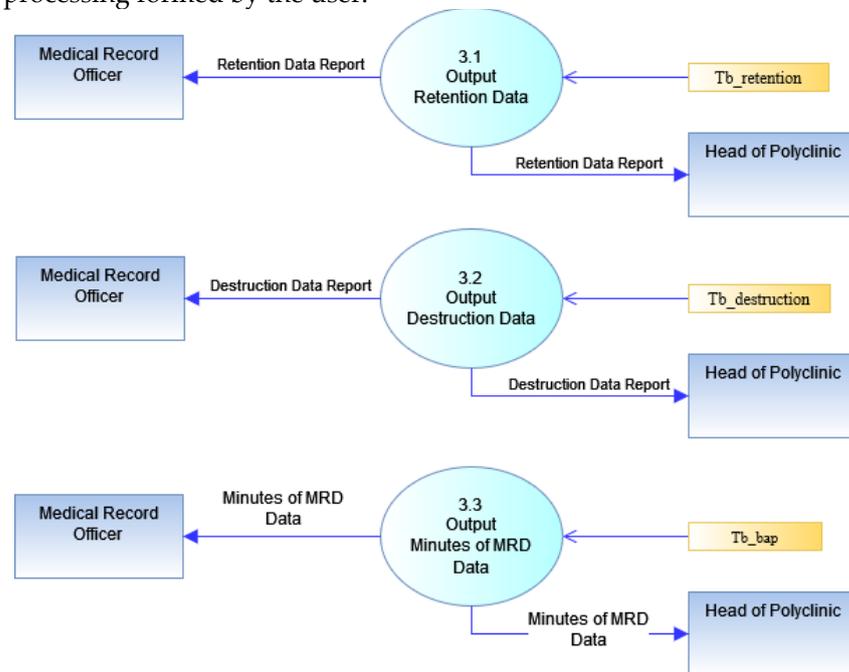


Figure 6. DFD Level 2 (retention output)

The Output (Report) process describes the data that has been processed in the transaction process and then printed to be reported to the medical record officer entity and the head of the polyclinic.

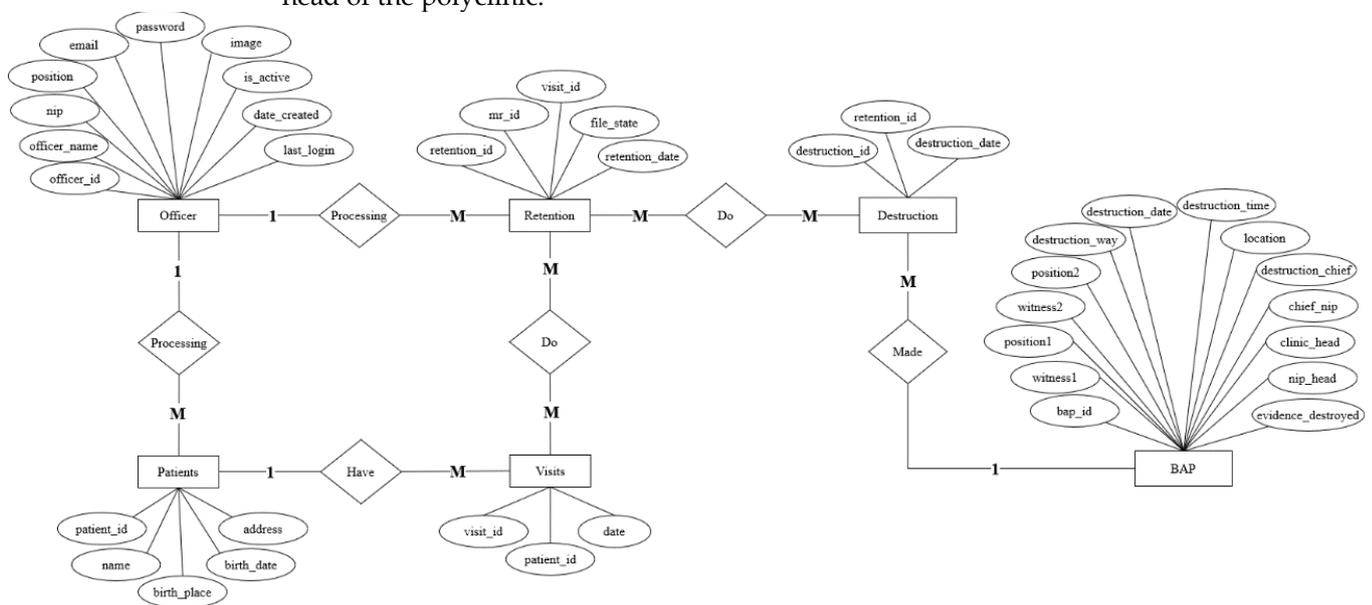


Figure 7. ERD Retention Information System

Entity relationship diagram is a relational description of conceptual data modeling that is connected between database storage [20]. The relationship diagram above consists of 6 entities namely officers, patients, visits, retention, destruction, and bap. These entities have 6 relationships that are interconnected with each other.

C. Implementation and Unit Testing

This stage contains the realization of the program or program unit from the results of the software design which is then tested according to its specifications. The results of the system design design are translated into a programming language according to the needs of the information system to be produced [21]. Researchers used the Hypertext Pre-Processor (PHP) programming language with the CodeIgniter 3 framework as a retention information system template. The CodeIgniter framework is a framework based on the MVC (Model, View, and Controller) folder to solve problems that occur in the system development process [22]. The following are the results of the software coding that has been built by researchers.

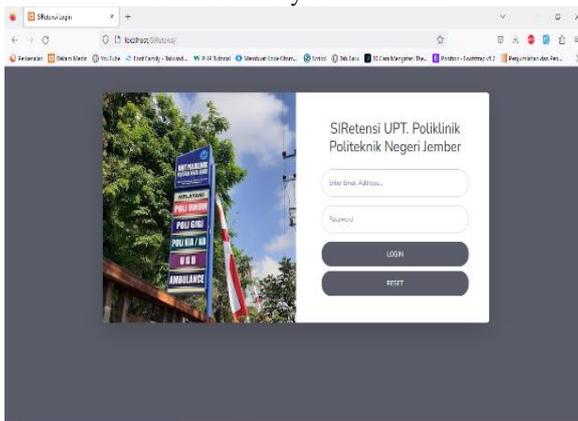


Figure 8. Login Form

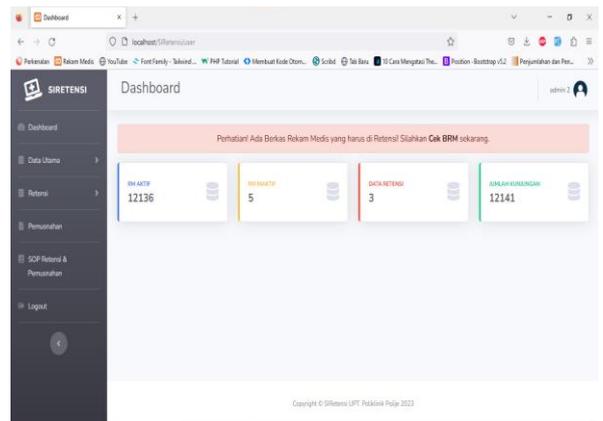


Figure 9. Dashboard Page

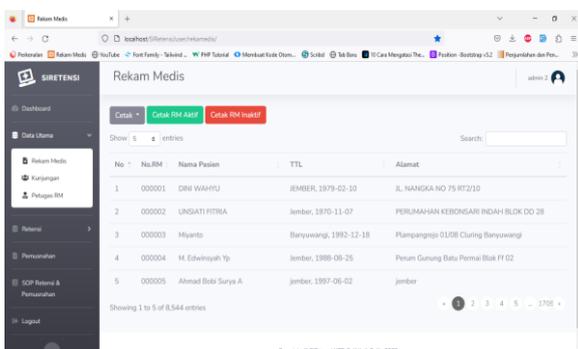


Figure 10. Medical Record Page

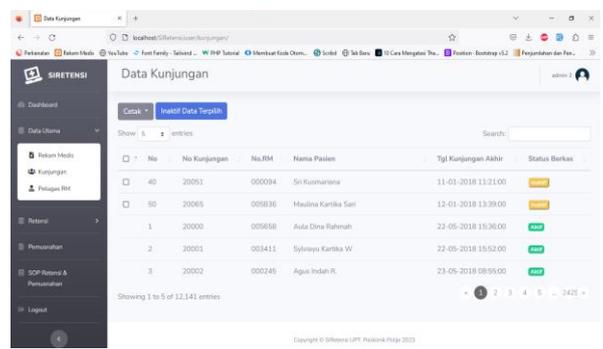


Figure 11. Visit Page

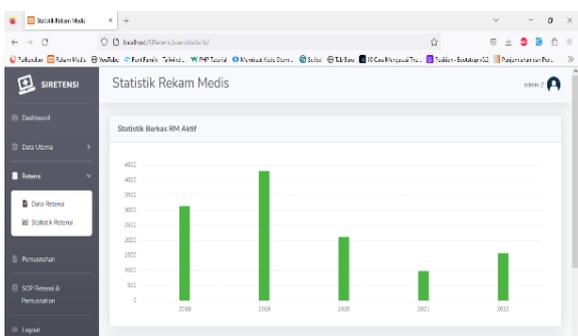


Figure 12. View MR Statistics

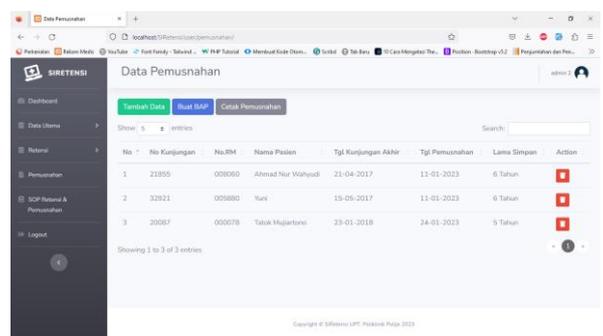


Figure 13. View of Destruction Data

D. Operation and Maintenance

The last stage is to maintain the web-based medical record retention information system that has been created and tested as a whole. This stage defines the system develop-

ment efforts made in anticipation of system improvements related to hardware and software [25]. Maintenance will be carried out periodically so that the system can be used for a long time.

4. Conclusions

The conclusion of this research is based on the research objectives that refer to the waterfall method. The needs analysis stage obtained the requirements needed for system design. The system design stage produces a design in the form of a system flowchart, context diagram, data flow diagram, entity relationship diagram, and user interface. The system that has been tested will continue at the system maintenance stage periodically so that the system can be used for a long time. The suggestion that researchers can give is that it is hoped that this web-based medical record retention information system can be developed again for features and displays that are not yet suitable for future researchers in order to produce a much better information system.

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