Diagnostic Imaging Management System in Batu Pahat Hospital

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ABSTRACT

Management System Development Department of Diagnostic Imaging at Hospital Batu Pahat is an effort to automate the existing manual system which includes the application of radiological, patient information storage, information storage staff, patient follow-up appointments, patient and personal property items stored equipment information manually. Storage of records in this manual will result in duplication of information if the patient came to do the x-ray follow-up. In addition, all patients who undergoing treatment radiological are required to leave their personal belongings outside the treatment room. This is likely the patient will lose personal items is high. The main purpose of this system to ensure the Diagnostic Imaging Department of Hospital Batu Pahat in upgrading and improving its service performance. Prototype Model development methodology used in this project. The system will help facilitate the management of daily operations of the Department of Diagnostic Imaging. As a result of this project is expected to assist the Department of Diagnostic Imaging towards more efficient management of the organization, in line with government efforts to provide the best service to the people.

1. Introduction

Medical services are an important aspect of our lives. Hence, hospitals are created to meet the needs of the community and solve various health-related problems. Government hospitals are created to assist and enable the inpatient citizens to receive appropriate medical services. Government hospitals charge lower than other health institutions. Compared to the charges imposed by the government is cheaper compared to the price of private health institutions.
In the era of rapid computing technology development, maximal use of computers can be seen as a tool that greatly helps hospital management in managing patient information. This is because the use of computers can improve the quality and efficiency of storing patient information management as well as the availability of other technology assistance such as the use of short message service (SMS). Therefore, the development of this system is very much needed to facilitate patient management information and reduce the problems faced.

The Diagnostic Imaging Management System at Batu Pahat Hospital is a web-based software that uses internet technology. Every access to the database is allowed only by using the user id number and password. More detailed description of the Diagnostic Imaging Management System at Batu Pahat Hospital includes statement of the problem, objectives and scope of the project for this system will be explained in the next section.

At this time, the Diagnostic Imaging Department staff manages the application of radiological examination by filling out the radiology examination application form, storing patient information which includes follow-up appointments, retention of personnel information as well as information about the condition of x-ray equipment without the use of computerized system method. Manually

saved information leads to some problems such as information may be lost or corrupt and information is also difficult to find and update. Because of this, the information became unsafe.

In addition, appointments between patients and doctors are manually made by the Diagnostic Imaging staff where the patient needs to go to the Diagnostic Imaging Department to make an appointment. This results in a waste of time on the part of the patient. In addition, the calculation of the number of x-ray examinations by year and the happening of x-ray examination based on x-ray types is done manually. The Department of Diagnostic Imaging stores the information in the log book and at each year they will analyze the information to compare whether or not there is improvement.

The Department of Diagnostic Imaging Department management is also difficult to manage Diagnostic Imaging Department equipment as difficult to know the movie's end date and machine life. Destruction reports also need to be done manually and they may suffer damage or loss.

The objectives of the system are to collect information related to the management of the Department of Diagnostic Imaging and identify existing management system problems in the Diagnostic Imaging Department and to develop and design a management systems at the Department of Diagnostic Imaging which includes the application of radiological examination, patient information storage, staff information storage as well as information on the state of x-ray equipment to automation systems to be systematic and organized and to reduce paper usage.

The Scope of the Diagnostic Imaging Management System at Batu Pahat Hospital is divided into two scopes. The scope of the user includes clerks, doctors, patients, x-ray department heads, and administrators for users using the system. The scope of the system covering the management of the Diagnostic Imaging Department at Batu Pahat Hospital is the radiology examination application modules, patient information modules including follow-up appointments, staff information modules and x-ray equipment module modules.

Patient information module contains information about old and new patients whether outpatient and inpatient patients including contact information and other types of patient illnesses. In addition, in patient information modules there is a storage of patients' personal property that allows patients to leave items that are not allowed into x-ray rooms without hesitation by simply recording the items they carry into the system with staff assistance. The staff information module consists of personnel information that manages the patient and sets the patient's date of follow-up via a short message service (SMS). The radiology examination application module determines whether a patient can make x-ray or not on their limbs. In the module radiology inspection application contains an appointment that allows the patient to know their follow-up appointment. X-ray equipment modules are related to the equipment available at the Diagnostic Imaging Department. The staff of the department will record each type of equipment available to determine whether the equipment is in good condition or not as a machine tool for performing ultrasound, mammography and CT scan (Computed Tomography Scanning)

The methodology used in order to develop this system is Prototype. The advantages of using this prototype model are such as the prototype model supports the development of systems that meet various user requirements that are difficult to identify, the prototype model can help the development of the system to identify the changing needs of consumers, the prototype model can explain the requirements between systems and users as well as to test and determine the appropriate design. Errors in certain phases in the prototype model can be identified faster before the entire system is generated. This will save you time system testing, launch processes and minimize the risk of system development. This model supports development for systems that meet various user-defined needs and involves discussions between system developers and system users before the actual system management of the Diagnostic Imaging Department is developed to ensure the developed system will meet the needs of the user.

The system uses simple and simple programming languages and is easy to understand by users. This is to enable users of the Department of Diagnostic Imaging Management System to understand the process of this program to be built. The programming language is important to develop a system. For the development of Diagnostic Imaging Department Management System, the programming language to be used is the PHP programming language. PHP has the advantage that PHP programming language is implied in which it can be inserted in the use of HTML processing (HyperText Markup Language). Any program required in the development process of the Department of Diagnostic Imaging Management System will be created using PHP software and the results will be viewed through Mozilla Firefox or Internet Explorer.

While SQL or MySQL is selected as a database for the Department of Diagnostic Imaging Management System as a storage store of data processed by the form. It is used as it is easy to review, systematic and fast and fast database management. The MySQL server also provides convenience in connecting PHP programs to databases. MySQL also reacts with PHP programs during a process involving the database and MySQL runs. The use of JavaScript programming is to output a message or run a process directly (automated) which can react directly without having to press on the button provided to run a process.

2. Implementation and Testing

Diagnostic Imaging Management System at Batu Pahat Hospital will be implemented and the system will store all the information in the system.

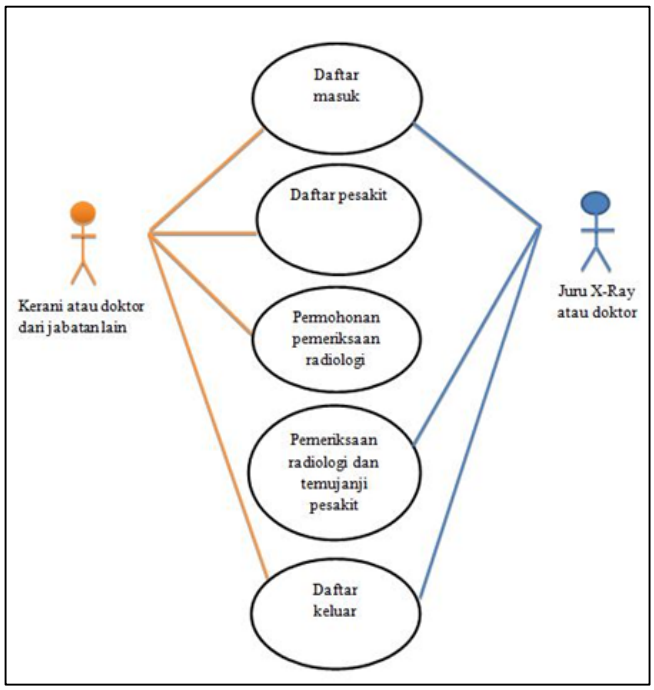

Figure 1: Use Case of Diagnostic Imaging Department Management System (Application Module for Radiological Examination)

Figure 1 above shows the use case diagram for the Department of Diagnostic Imaging Department management system for radiology examination application module

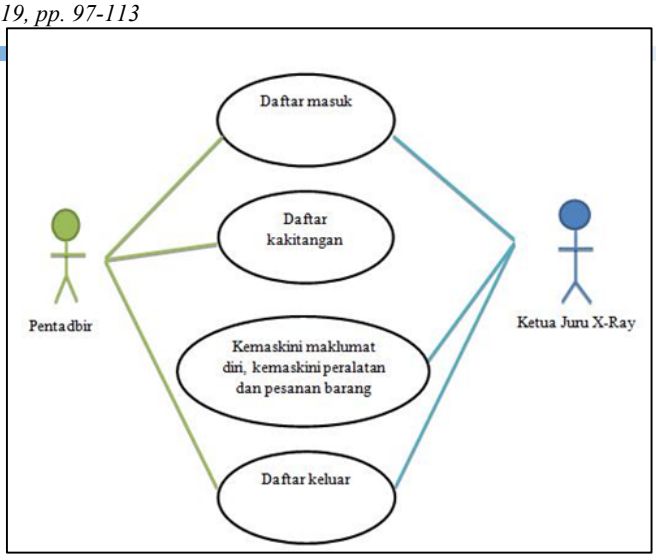

Figure 2: Use Case for Diagnostic Imaging Department Management System (X-Ray Goods Equipment Order and Order Module)

Figure 2 shows the Diagnostic Imaging Department Management System for X-Ray Goods Equipment Order and Order Module.

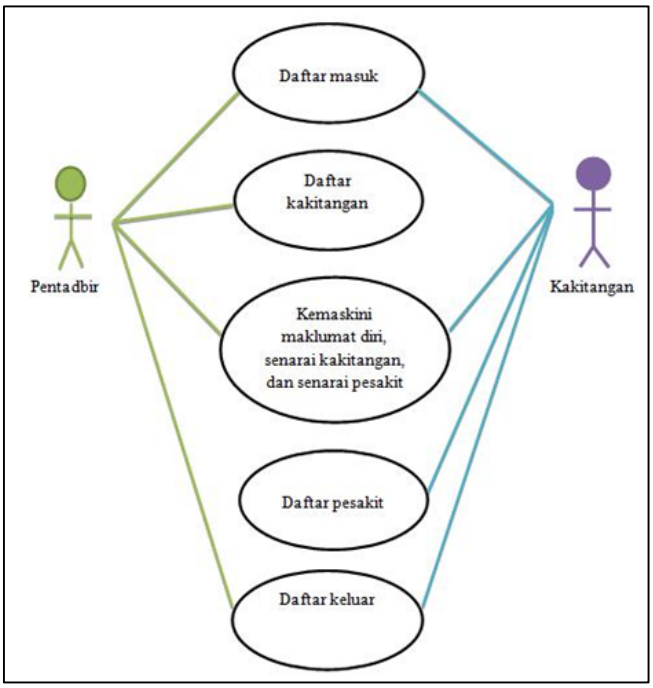

Figure 3: Use Case of Diagnostic Imaging Department Management System (Staff Information Module)

Figure 3 shows the of Diagnostic Imaging Department Management System for the Staff Information Module.

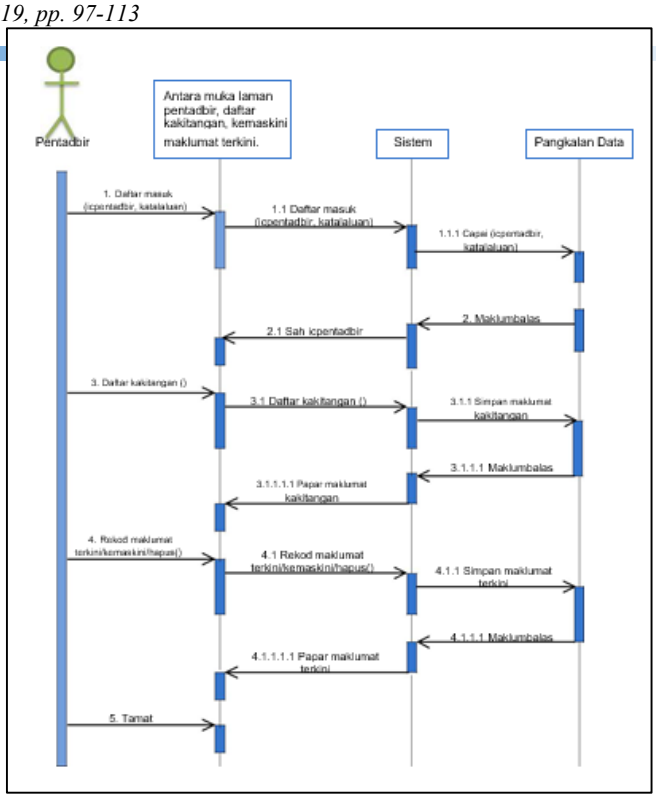

Figure 4: Sequence Diagram for Staff List and Updates of Updates by Administrators

Figure 4 shows Sequence Diagram for the staff list and updated information by the administrator. Administrators will include user id and password to get confirmation from the system to login into the system and access the administrator's page and update his / her information. The system will respond by verifying the admin user id. Administrators will list employees for each department as well as staff positions. The system will keep all registration of the registered staff. Administrators can update the latest information and display for other staff information. The administrator terminates the process after completing the new staff registration.

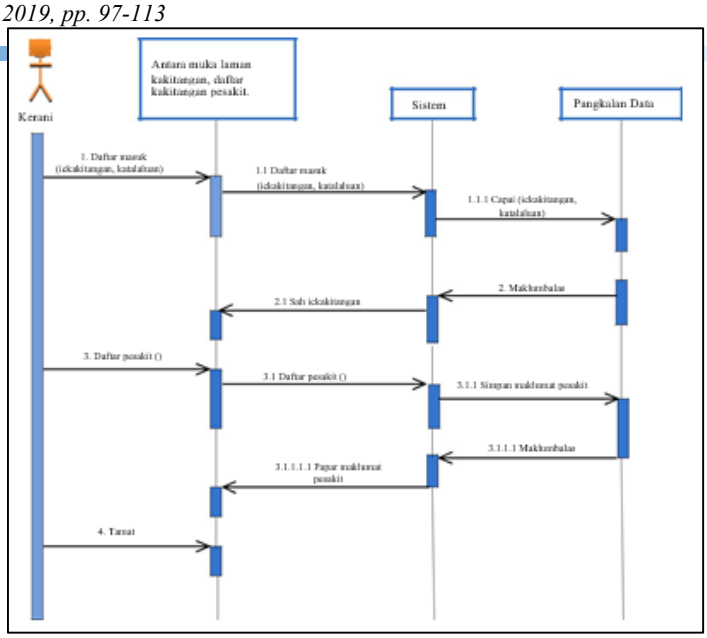

Figure 5: Sequence Diagram for Patient List by Staff

Figure 5 shows Sequence Diagram for the patient's list of patients. Staff will enter user id and password to get confirmation from the system to log into the system and reach the staff page. The system will respond by verifying the user's user id. Staff will register patients who want to make x-ray examination. The system will store all registered patient registration information. The staff completes the process after completing a new patient registration.

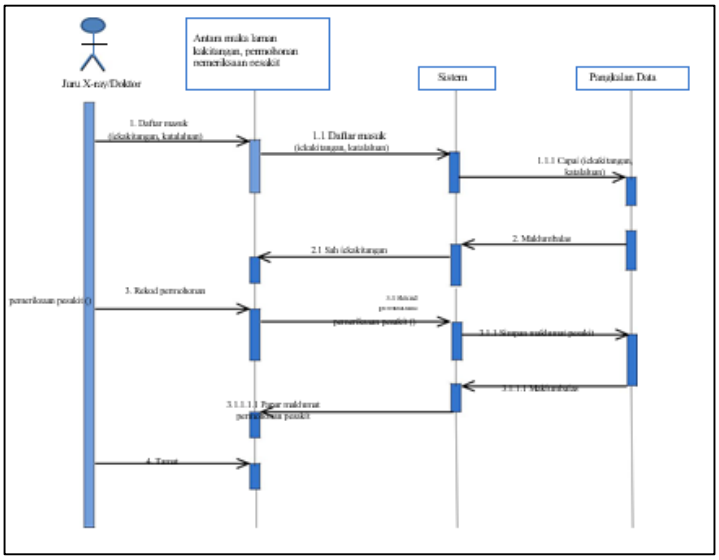

Figure 6: Sequence Diagram for Patient Examination Application by Staff

Figure 6 shows the description of the Sequence Diagram for patient examination application by staff. Staff will enter user id and password to get confirmation from the system to log into the system and reach the staff page. The system will respond by verifying the user's user id. The staff will check the record of the patient's examination application that wants to make x-ray examination. The system will retain all registered patient registration information. The staff completes the process after checking out a new patient

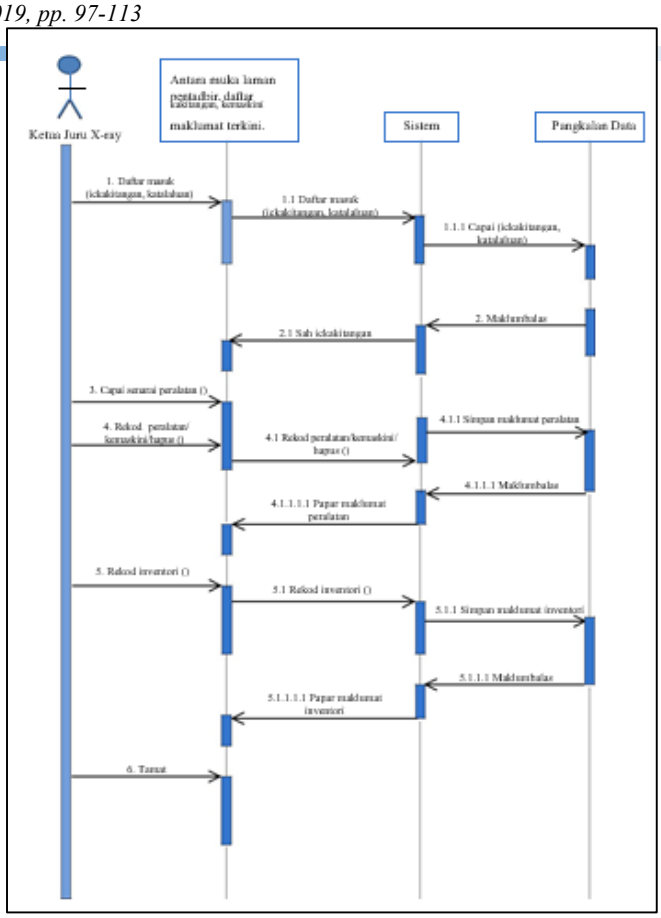

Figure 7: Sequence Diagram for Equipment and Order Update by Staff

Figure 7 shows the description of the equipment updates and goods orders by staff. Staff will enter user id and password to get confirmation from the system to log into the system and reach the staff page. The system will respond by verifying the user's user id. Employees will check equipment records, update or remove equipment. Staff will apply for additional goods orders if necessary. The system will store all the information on the equipment and order of listed items. The staff completes the process after completion of adding new equipment or goods orders.

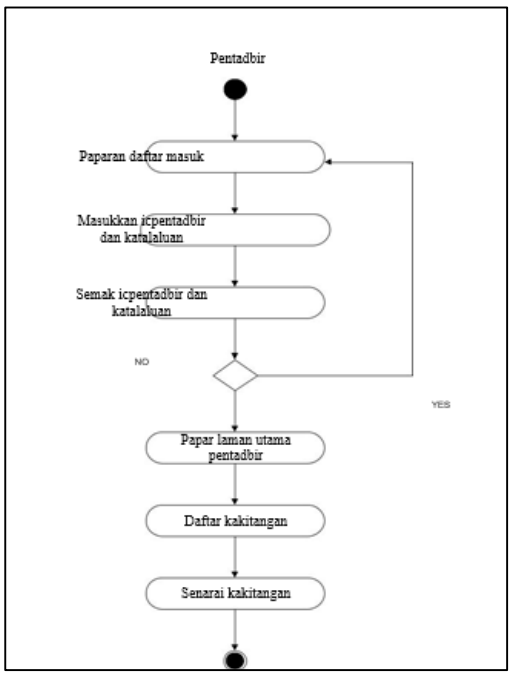

Figure 8: Activity Diagram for Administrator

Figure 8 is the Activity Diagram in the Management System of Department of Diagnostic Imaging Department of Batu Pahat Hospital. Based on the diagram, administrators can sign in to this system by entering the administrator and password. If the administrator and password are correct, it will display the administrator's homepage where the administrator can register the staff from the other department and the administrator can also view the list of available staff.

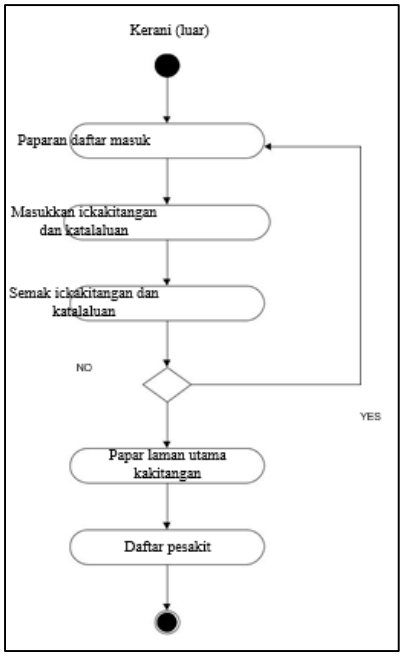

Figure 9: Activity Diagram for Clerk

Figure 9 shows a clerk's activity diagram to register a patient. Referring to this diagram, clerks can sign in to the system by entering ick staff and passwords. If the ick staff and passwords are correct, they will display the clerk's home page where the clerk can register the patient.

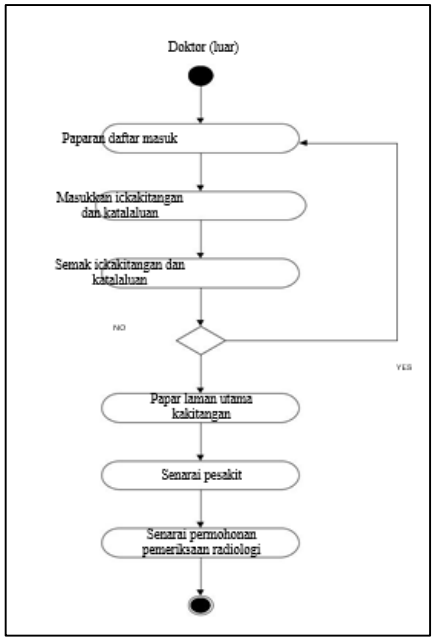

Figure 10: Activity Diagram for Doctor

Figure 10 shows a doctor's diagrams from other departments to allow patients to undergo radiological examination. Referring to this diagram, doctors can check in this system by entering ick staff and passwords. If the ick staff and passwords are correct, they will display the doctor's homepage where the doctor can fill out the patient examination application form for patients who require x-ray checks.

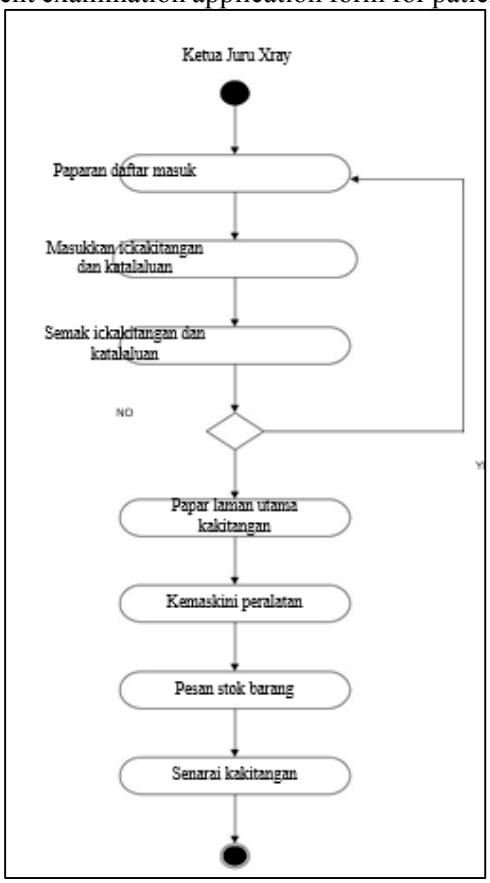

Figure 11: Activity Diagram for Radiographer

Figure 11 shows the Activity Diagram for Radiographer.

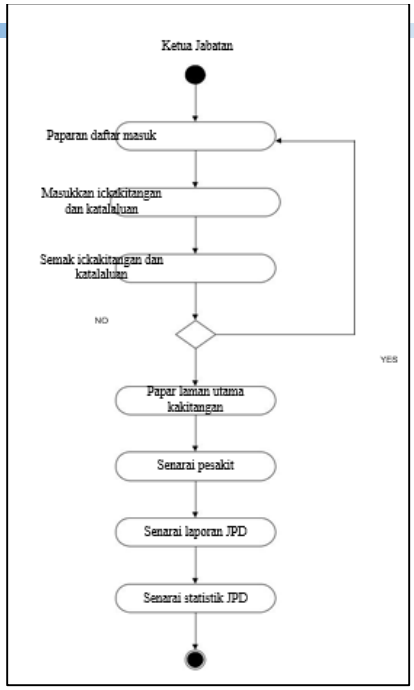

Figure 12: Activity Diagram for Radiographer Head Department

Figure 12 shows the Activity Diagram for Radiographer Head Department.

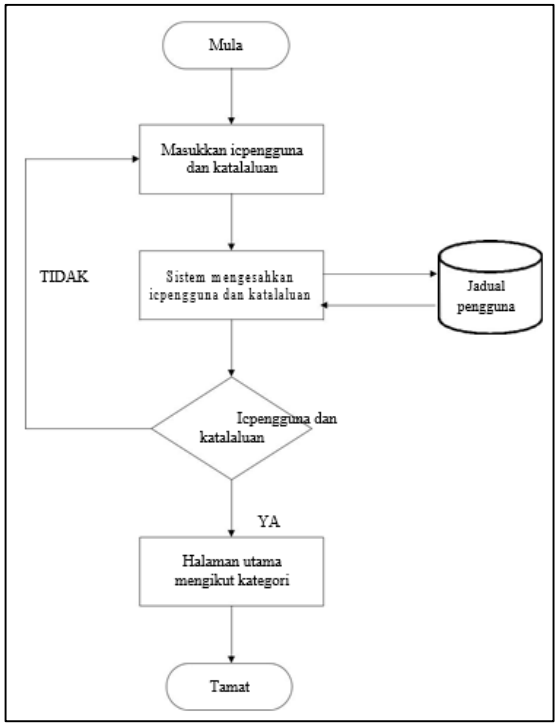

Figure 13: Flowchart for Registration

Figure 13 shows the flowchart for registration. In order to login into system, the user signs in with the user's username and password. This system will verify the user's number and password used. If user and password numbers are verified, the user's home page by category will be shown. On the other hand, if user and password numbers are not verified, users are required to enter again to make sure there is no error when entering user and password numbers.

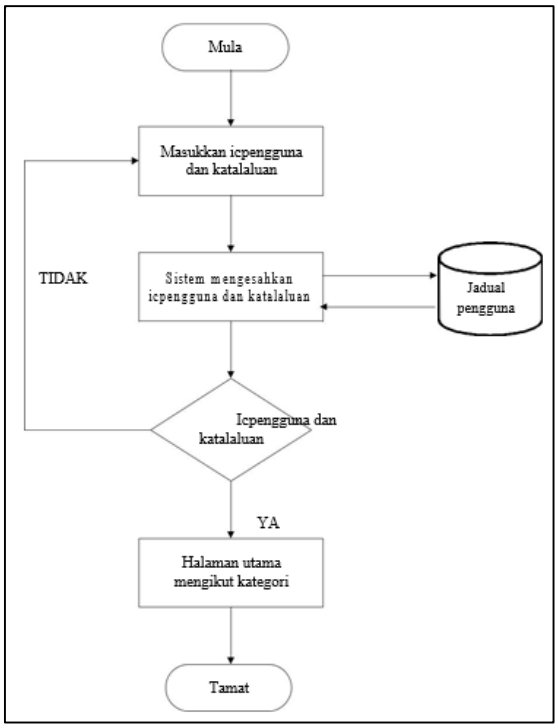

Figure 14: Flowchart for Administrator

Figure 14 shows the flowchart for administrator. After successfully login into system, administrators can select the menu that appears on the administrator's homepage. Administrators can update personal information, register staff, and view list of registered staff. Additionally, administrators can update or delete current information (current news).

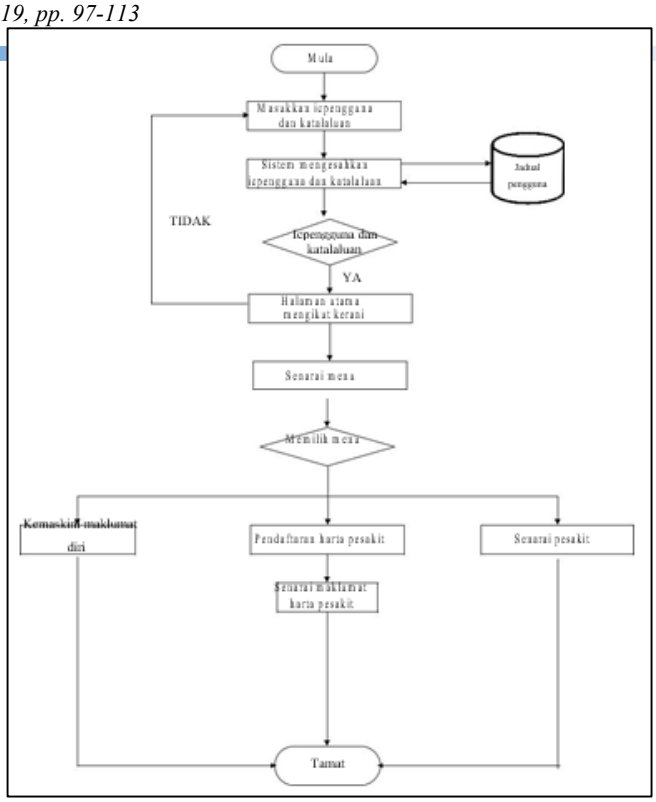

Figure 15: Flowchart for Clerk

Figure 15 shows the Flowchart for Clerk. After successfully entering the system, the clerk (Department of Diagnostic Imaging) can select the menu on the main doctor's page. There are three menus, the menu of self-update information, the patient's registry registration menu, the list of patient property information, and the patient list menu. The update information menu allows clerks to update their information. The patient registration menu where before a patient was allowed to enter the x-ray room, they were asked to leave the unauthorized items into the x-ray room. The clerk will register the item to ensure the safety of the item. Clerks can see a list of patient property information after a patient undergoes x-ray examinations. The patient list menu will show a list of patients who undergo radiological examination on that day.

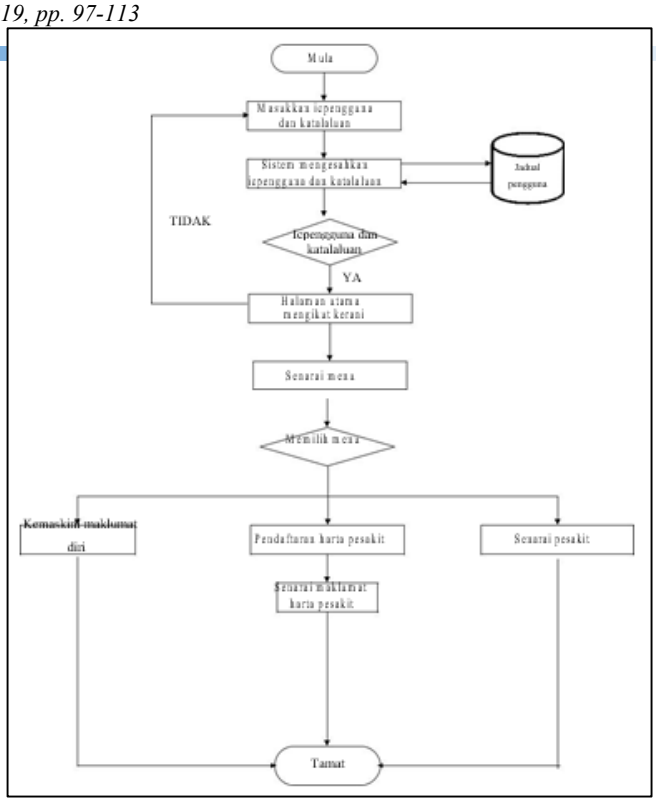

Figure 16: Flowchart for Radiographer

Figure 16 shows the Flowchart for Radiographer. After successfully entering the system, radiographer can choose the menu on the main x-ray page. There are two menus namely the menu of personal information update and patient search. The update information menu allows the x-ray update of his / her information while the patient search menu, allowing x-rays to look at the list of patients applying for x-rays where they have been authorized by doctors from other departments.

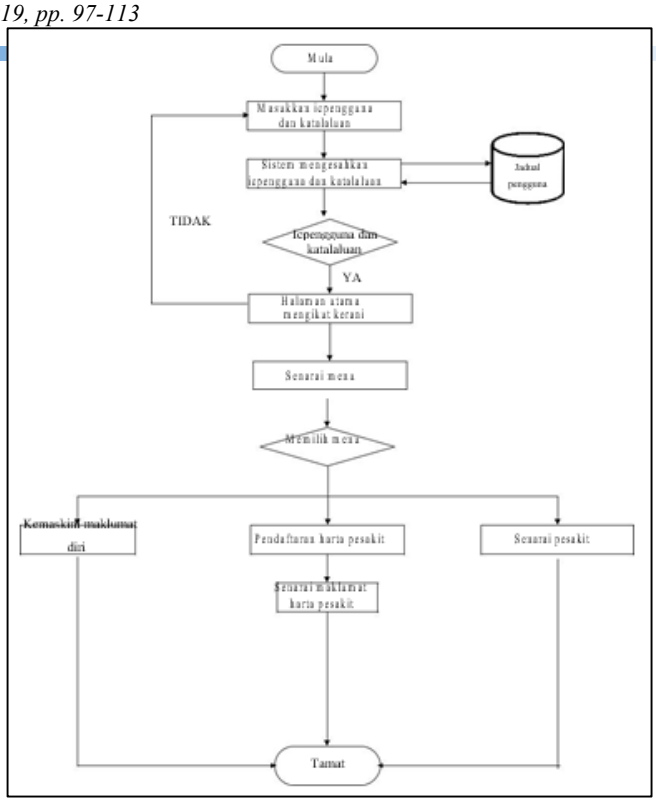

Figure 17: Flowchart for Radiographer Head Department

Figure 17 shows the Flowchart for Radiographer Head Department. After successfully entering the system, the head of the department can choose the menu on the main page of the department head. There are six menus namely update menu of personal information, tool update menu, order form, search staff, find patients, and reports and statistics. Updates to the department's own information menu updates on his / her own information, the update menu of equipment which allows the department head to update equipment either in good condition or not. The goods order form is filled in order to order equipment that is almost exhausted. The staff search menu also allows the department head to look at the list of staff in the Department of Diagnostic Imaging according to the position. The patient list menu allows the department head to look at the list of patients from which department and the type of check-up made by the patient.

Figure 18: Interface for Patient Property Information

Figure 18 shows the patient property information before entering into a radiological examination room. Clerks in the Diagnostic Imaging Department must include patient property information if the patient carries the item in the carry case into the x-ray room.

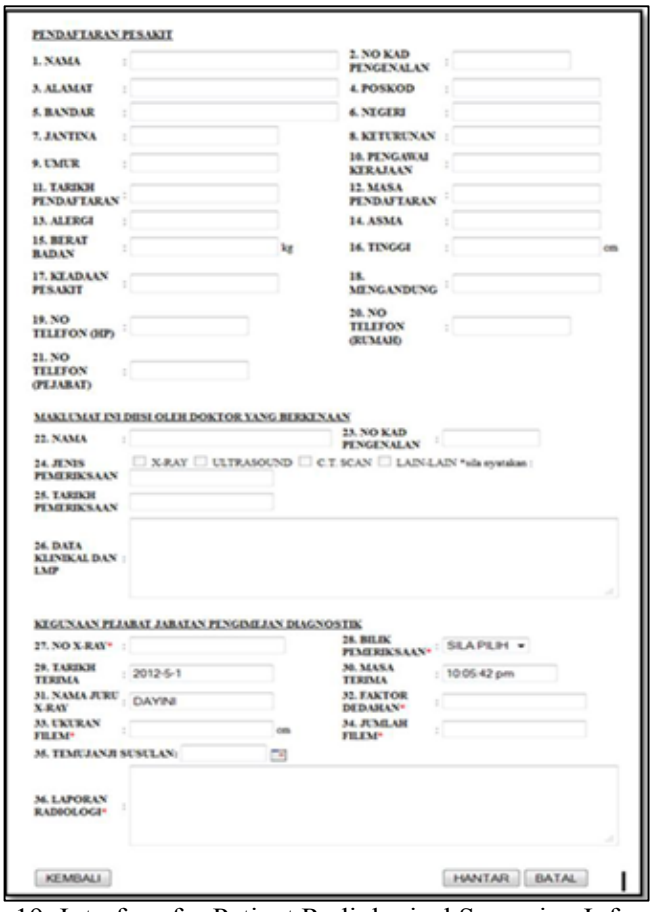

Figure 19: Interface for Patient Radiological Screening Information

Figure 19 shows interface for Patient Radiological Screening Information

After this system is developed in the implementation phase, the system testing process needs to be done before sending it to the system user. The purpose of the system test is to ensure that the program code syntax is correct, to ensure that the logic used in the program code is correct and to ensure that the written code is properly extracted and to produce the desired output.
There are several types of testing performed such as testing of databases, input testing and system output and unit testing.

Table 1: Testing Process

Testing	Expected Result	Actual Result
Database	Successfully connect with database	Successfully connect with database
Input and output of the system		
- no data inserted	Login failed. Error message will appear	Login failed. Error message will appear
-wrong data inserted	Login failed. Error message will appear	Login failed. Error message will appear
Unit Testing	Every module properly function	Every module properly function

Table 5 shows the tests for modules for Management System Development Department of Diagnostic Imaging at Hospital Batu Pahat.

Overall, all parts of the system have been implemented separately to facilitate testing to avoid any system errors. Testing activities have been described clearly after system tests are being run by the builders themselves. Implementation of testing and evaluation of this system is important to ensure that the developed system meets the specifications and requirements of the user.

3. Results and Discussion

Based on testing has been made, all objectives are achieved and can be use by all user for Management System Development Department of Diagnostic Imaging at Hospital Batu Pahat.
All module is functioning well according to scope required. This Diagnostic Imaging Department Management System has the advantage of either system administrator or system user. Amongst the advantages of the system is that the system has various functions such as registering patient information, registering patient property, applying radiology checks, updating equipment condition details and ordering stocks, generating reports and statistics related to management in Diagnostic Imaging Department to in the system. This system allows staff to get patient-related reports quickly and regularly. Additionally, user friendly and interesting interface is important in the development of a system to ensure users understand how to use them well and this system is easy to maintain if there is a modification to this system in the future. The login system has a high level of control because only certain parties are administrators who can use this system. Administrators have full control over developed modules where other users cannot access this system without being listed first by administrators.

4. Conclusion

In conclusion, for Management System Development Department of Diagnostic Imaging is to improve the quality of the Radiography process. This system can help to reduce the paper usage and avoid redundancy. All the objectives are achieved and can be use without any error.

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