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Design of Inpatient Medical Record Borrowing Information System at Assyifa Islamic Hospital, Sukabumi City

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Abstract: The orderly and documented management of borrowing and returning medical records is an important factor in improving the quality of hospital services. This study aims to design an efficient inpatient medical record Lending Information System and support the performance of officers. System development using Agile methods with Microsoft Visual Studio Code applications, PHP programming language, and MySQL database. The results showed that the system was able to reduce the risk of document loss, medical record placement errors, and the workload of medical records officers. The current condition, the borrowing process is still done manually through the expedition book so that it has the potential to cause loss, misfile, and increase the workload. The proposed system design allows the borrowing process to be digitized, so that the risk of loss and misplacement can be minimized and support the work efficiency of officers. In the future, this system has the potential to be further developed so that it can be integrated with HMIS as a whole, so that it becomes a more effective and efficient solution in managing inpatient medical record borrowing.

Keyword: Medical Records Loans, Information System, HMIS, Inpatient care, Agile

INTRODUCTION

The rapid development of digital technology has driven society into the digitalization era and transformed various aspects of life (Inka Rahmawati et al., 2023). Technology has now become an important factor in supporting institutional development and competitiveness, especially in the quality of public services. Computers play a role as a medium for processing data into information as well as a storage facility to streamline operations, including in healthcare services (Tarenta Sari et al., 2021). Healthcare services require accurate, relevant, and interconnected data (Raden Rakasiwa Wijaya et al., 2023). At present, many hospitals have adopted computerized systems to support service activities, such as patient data recording, medical information management, and other administrative processes that were previously carried out manually (Ramadhani et al., 2022).

One form of advancement in information technology in the health sector is the implementation of Electronic Medical Records (EMR). This technology provides many benefits in improving the quality of healthcare services and strengthening the overall healthcare system. In addition, EMRs can be further developed to address challenges such as interoperability, operational efficiency, and flexibility in responding to changes (Kesdam & Banjarmasin, 2023). The recommendation for EMR use encourages more healthcare facilities to implement it in order to improve service quality, increase patient satisfaction, and minimize clinical errors (Santoso et al., 2020).

According to research (Zuhro et al., 2020), medical records have seven uses: administrative, medical, legal, financial, research, educational, and documentation aspects. These seven functions make medical records often borrowed from the medical records unit. Therefore, to prevent medical records from being lost and to maintain their confidentiality, a borrowing and returning logbook, known as the expedition book, is required. Generally, hospitals and community health centers still use this expedition book to record the borrowing and returning of medical records. This process takes a considerable amount of time because it is done manually, and the simultaneous use of the book often causes queues as well as delays in delivery to the polyclinic. Furthermore, the borrowing receipt is still recorded manually (Suryawan et al., 2023).

Effective management of borrowing and returning medical record files is very important to ensure the continuity of patient services. However, many healthcare facilities still face challenges in managing these files optimally (Arta et al., 2024). Borrowing medical records is the process of retrieving files by doctors for follow-up or research purposes. In emergency and inpatient units, borrowing is carried out according to the predetermined return schedule. Every borrowing and returning activity must be properly controlled to prevent document loss and misfiled records (Setiatin & Abdussalaam, 2021).

Research findings show that medical record services have begun to be implemented digitally (Septyani Juanda et al., 2024). Assyifa Islamic Hospital in Sukabumi City is also among the healthcare facilities that have implemented a web-based hospital information system and Electronic Medical Records (EMR). However, some processes, such as inpatient medical record borrowing, are still carried out conventionally because the conversion of inpatient medical record documents has not been fully completed. Assyifa Islamic Hospital still stores manual medical records created before the EMR was developed. Therefore, it is necessary to design a digitized inpatient medical record borrowing system to improve service efficiency and minimize the risk of loss or misplacement of medical records.

This study aims to design a digitized inpatient medical record borrowing information system that is easy to operate by medical record officers. The system is developed using Microsoft Visual Studio Code with PHP as the programming language and MySQL as the database. It is expected that this system can improve service efficiency, accelerate document retrieval, reduce the loss of medical records, and support optimal medical record management. In addition, this system has the potential to be further developed and fully integrated with the Hospital Information System (HIS).

METHOD

Research in this field applies the agile method, which is a system development approach that emphasizes rapid responsiveness among developers in dealing with changes. It can also be defined as a fast-paced software development method based on shared principles throughout the process (Nurfalah et al., 2024). This method consists of six stages: Requirements, Design, Development, Testing, Deployment, and Review.

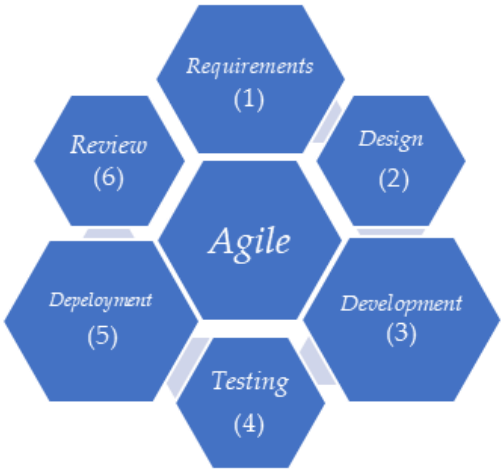

Figure 1. Metode *Agile*

1. Requirements

The system requirements stage begins with analyzing user and system needs. This process is carried out through observation and discussions with the Head of the Medical Records Unit as the basis for designing the digital system.

2. Design

The design stage involves preparing program illustrations or interfaces tailored to the system to be developed, based on the needs analysis previously discussed. The design not only includes the program interface but also the system structure, such as Use-Case Diagrams, Activity Diagrams, and Class Diagrams.

3. Development

The development stage covers the processes of coding, design, system requirement fulfillment, and testing. At this stage, the researcher begins coding and testing the program (Irwansyah et al., 2023) to create an interface that can be operated by users. Coding is conducted using Microsoft Visual Studio Code with PHP as the programming language and MySQL as the database.

4. Testing

The next stage is system quality testing using the Black Box Testing method. This testing aims to detect potential system errors, evaluate system functionality performance, and ensure that the system runs according to the predetermined specifications (Aulia et al., 2024).

5. Deployment

After the testing stage, the developed system is implemented and used by users to support the delivery of integrated information.

6. Review

This is the final evaluation stage to ensure the system operates according to user needs, as well as to identify potential errors, deficiencies, and strengths within the system.

This research employs a descriptive qualitative approach using observation, interviews, and literature study.

1. Observation

Data collection was conducted by directly observing the research object to obtain a real picture of the phenomena being studied. As an initial step, the researcher carried out observations to gain an actual understanding of the workflow and challenges in the inpatient medical record borrowing process at Assyifa Islamic Hospital, Sukabumi City.

2. Interview

Data collection was carried out through interviews with resource persons to obtain in-depth information related to the research topic. The researcher conducted interviews with the Head of the Medical Records Unit, during which a series of questions were asked to gather the necessary and relevant information.

3. Literature Study

Data collection was also conducted by reviewing information from literature, books, journals, and previous research related to the topic under study (Sulastri et al., 2023).

RESULT AND DISCUSSION

1. Requirements

In the initial stage, interviews and observations of health information system users were conducted. The data obtained were utilized to understand user needs in interacting with the health information system (Nurkhotimah et al., 2023). The researcher held direct discussions with the Head of the Medical Records Unit to analyze the requirements needed to support the medical record borrowing system. This discussion covered the main problems to be addressed as well as the limitations that need to be set, both from the user side and the system to be developed.

2. Design

The design stage involves preparing program illustrations or interfaces tailored to the system to be developed, which include Use-Case Diagrams, Activity Diagrams, and Class Diagrams. Figure 2, the Use Case Diagram, is a visual representation that illustrates the functions within a system by emphasizing the interactions between users (actors) and the system. This diagram focuses on an overview of the system's main functions rather than the details of each function. An actor here refers to an entity that serves as a user directly involved in interacting with the system (Ismayati et al., 2024). In Figure 2, there are four actors in the development of the Inpatient Medical Record Borrowing Information System, namely the HIS (Hospital Information System) Officer, Registration Officer, Medical Record Officer, and Head of Medical Records.

Figure 3, the Activity Diagram, is a visual representation of a sequence of interrelated activities. This diagram illustrates the flow of a process from beginning to end and describes the stages that occur throughout the process (Najrifatussya'diah et al., 2024). In Figure 3, the actor (Medical Record Officer) accesses the system and logs in as a medical record staff member. The officer enters the login page, then inputs an email and password. If successfully authenticated, the actor is directed to the dashboard page. The actor then opens the borrowing menu and is automatically redirected to the borrowing page if there is a request to borrow a medical record.

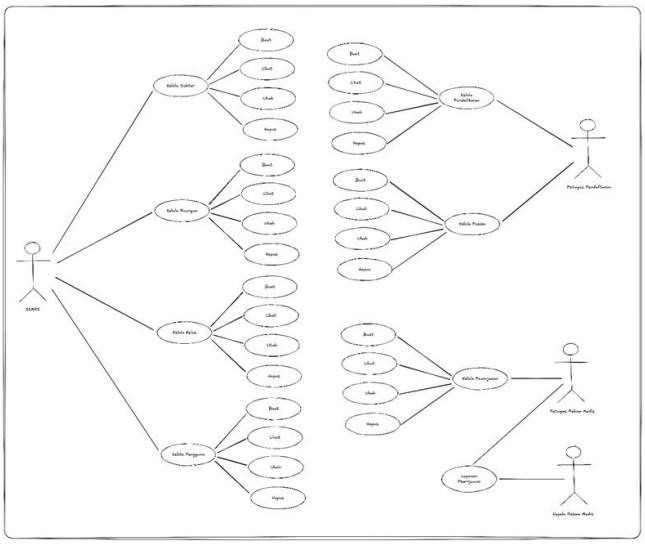

Figure 2. Use-Case Diagram

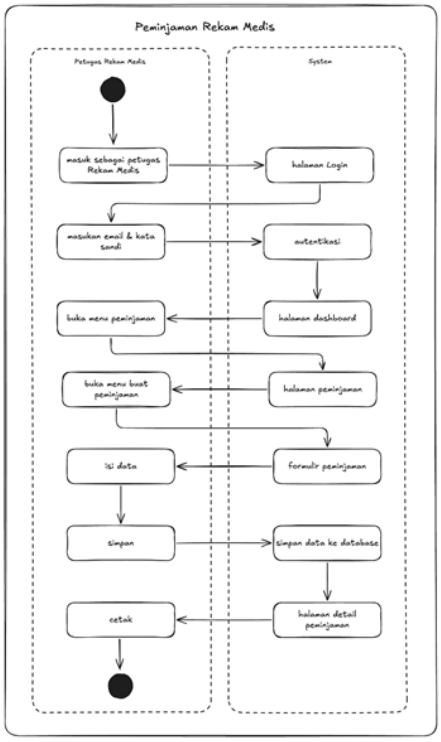

Figure 3. Activity Diagram

Figure 4, the Inpatient Registration Activity Diagram, illustrates the sequence of activities in the inpatient registration process. In this diagram, the actor (Registration Officer) accesses the system and logs in as a registration staff member. The officer enters the login page, inputs an email and password, and if successfully authenticated, is directed to the dashboard page. The actor then opens the registration menu and is automatically redirected to the registration page when there is a patient to be registered. Next, the actor accesses the registration form, inputs the patient's identity data, searches for an inpatient room and class according to the guarantor, selects the attending doctor, and fills in other required information for the inpatient registration process. Once completed, the data is saved, and the system automatically stores it in the database. Finally, the user is redirected to the registration detail page.

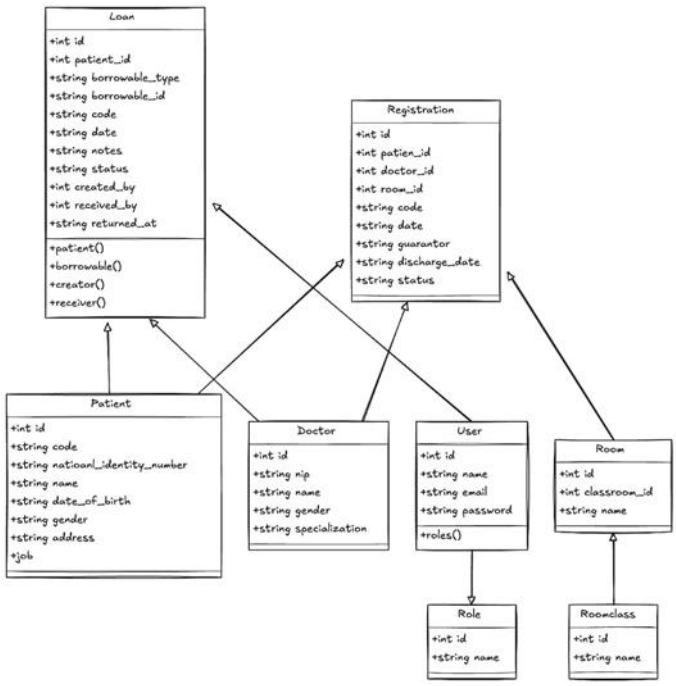

Figure 5. Class Diagram

Figure 5, the Class Diagram, is a visualization of the system structure that illustrates the classes along with their attributes and operations. This diagram includes the entities involved, ranging from authentication to data management and reporting, and helps in understanding the static structure and relationships between entities within the system (Monika et al., 2024). In Figure 5, the Class Diagram consists of several entities, namely User, Role, Doctor, Room, RoomClass, Patient, Registration, and Loan.

3. Development

The development stage is the process of system construction, which includes coding, design, system requirement fulfillment, and testing. At this stage, the implementation of the interface in the Inpatient Medical Record Borrowing System is displayed and operated by the user. The coding in this design was carried out using Microsoft Visual Studio Code with PHP as the programming language and MySQL as the database.

System Interface Implementation

The system interface implementation refers to the process of realizing the user interface design into an operational form that can be accessed and utilized by users. This stage focuses on translating system requirements and design into interactive display components that support user activities, such as login, dashboard navigation, inpatient registration, and medical record borrowing. The interface is designed to be user-friendly, efficient, and aligned with the functional needs of medical record officers, registration staff, and administrators, ensuring smooth interaction between users and the system.

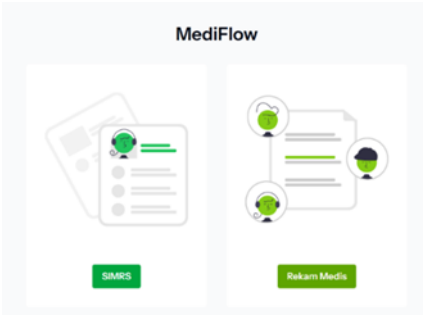

Figure 6. Main Page Display

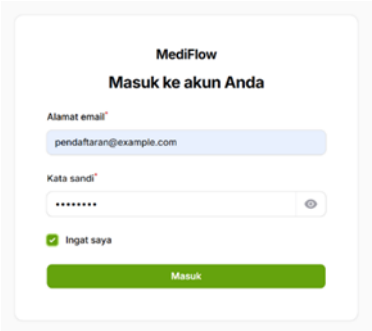

Figure 7. Login Page

Figure 7 shows the login page of the system. On this page, users are required to enter their email address and password as authentication credentials. The login page functions as an access control mechanism to ensure that only authorized users can proceed to the dashboard and utilize the system features according to their respective roles.

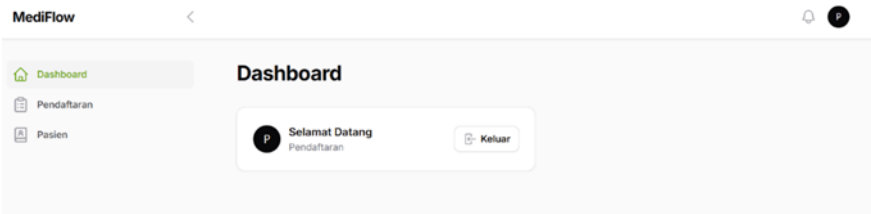

Figure 8. Dashboard

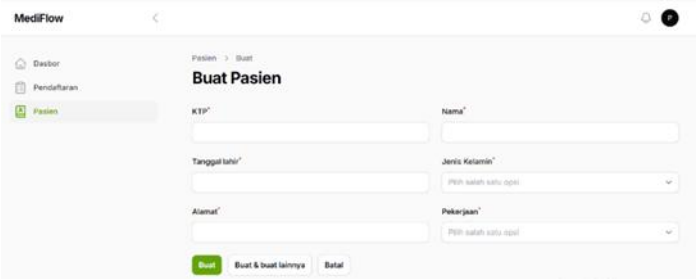

Figure 9. Patient Page

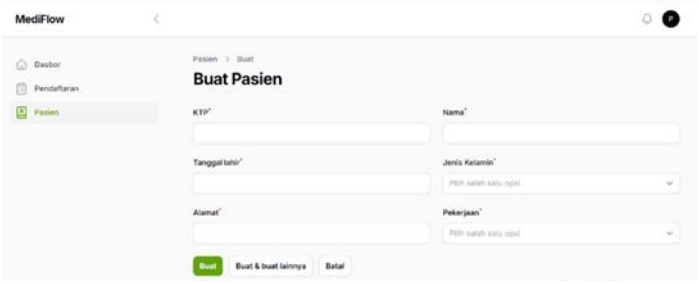

Figure 10. Create Patient Page

Figure 10 illustrates the Create Patient page, which includes input fields such as National Identity Number (KTP), Name, Date of Birth, Gender, Address, and Occupation. This page functions to register a new patient during the inpatient registration process, ensuring that complete and accurate patient data is stored in the system database.

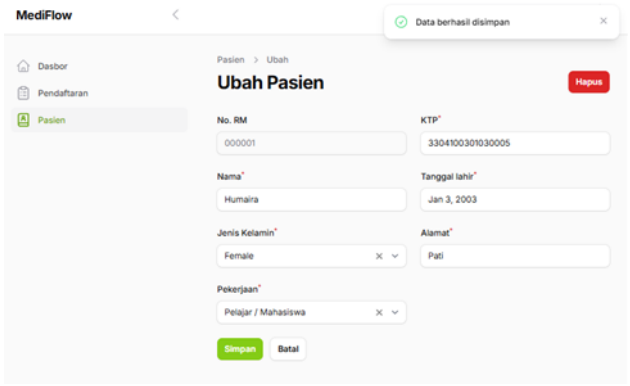

Figure 11. Edit Patient Page

Figure 11 shows the Edit Patient page, which is used to update or modify patient information that has already been recorded in the system. This page allows users to correct or complete patient data, such as name, date of birth, gender, address, or occupation, ensuring that the medical record database remains accurate and up to date.

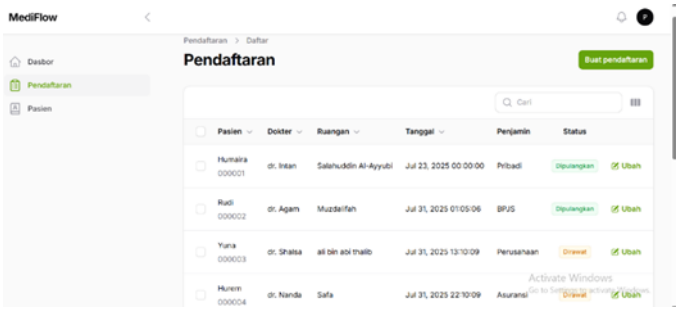

Figure 12. Inpatient Registration Page

Figure 12 displays the Inpatient Registration page, which is used by registration officers to record patient admission data. On this page, officers can input patient identity information, select the appropriate room and class according to the guarantor, assign the responsible doctor, and fill in other necessary details related to inpatient registration. Once the data is saved, the system automatically stores the information in the database and generates registration details for administrative and service purposes.

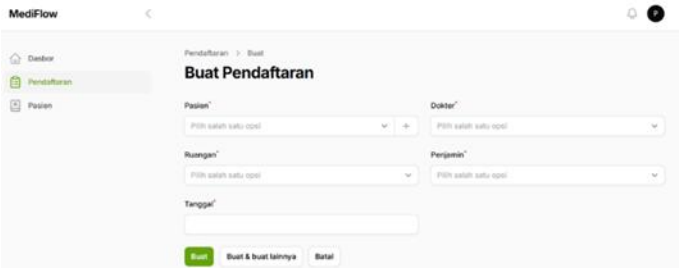

Figure 13. Create Registration Page

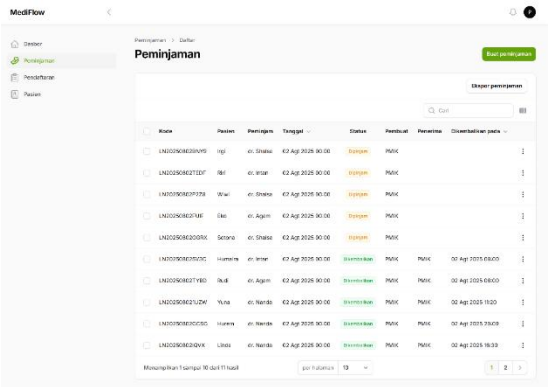

Figure 14. Inpatient Medical Record Borrowing Page

Figure 14 displays the Inpatient Medical Record Borrowing page, which is used by medical record officers to manage the borrowing of patient medical record files. On this page, officers can search for patients by name or medical record number, select the doctor requesting the record, and fill in other required details related to the borrowing process. Once completed, the system automatically saves the borrowing data into the database, ensuring proper documentation and facilitating monitoring of borrowed medical records.

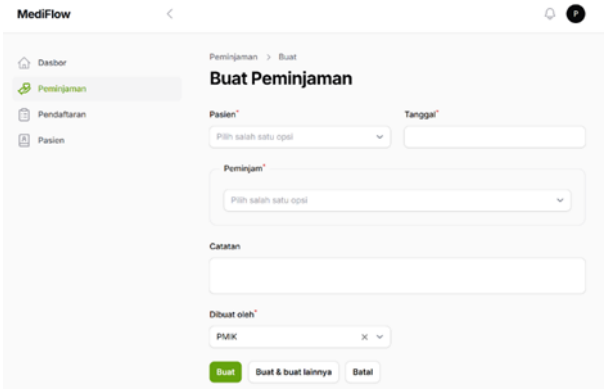

Figure 15. Create Borrowing Page

Figure 15 shows the Create Borrowing page, which is used by medical record officers to record new borrowing transactions for inpatient medical records. On this page, officers can search and select the patient's medical record, determine the requesting doctor, and fill in other relevant information required for the borrowing process. After the form is completed, the system automatically saves the transaction into the database, ensuring accurate documentation and traceability of medical record loans.

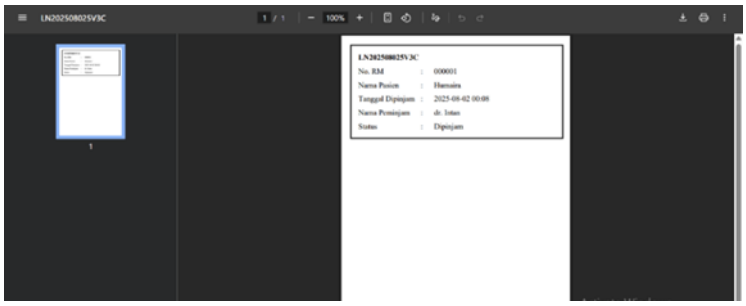

Figure 16. Borrowing Receipt Page

Figure 16 shows the Borrowing Receipt page, which contains information such as the Registration Code, Medical Record Number, Patient Name, Borrowing Date, Borrower's Name, and Status. This page functions as proof that an inpatient medical record has been borrowed, serving as a reference for monitoring and ensuring that the medical record is properly tracked within the system.

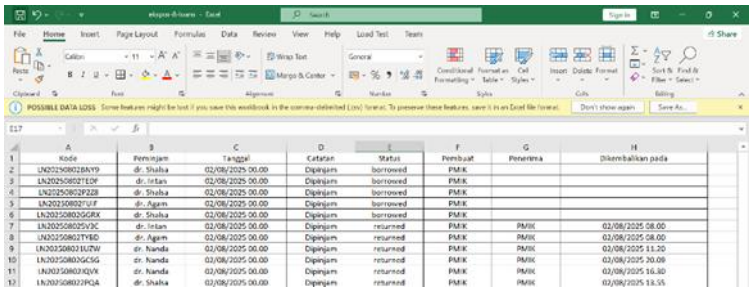

Figure 17. Inpatient Medical Record Borrowing Report Page

Figure 17 displays the Inpatient Medical Record Borrowing Report page. This page presents a recap of borrowing transactions, including details such as the Registration Code, Medical Record Number, Patient Name, Borrowing Date, Borrower's Name, and Status. The report functions as a monitoring tool for medical record management, enabling officers and unit heads to oversee the borrowing process and ensure that medical records are returned according to established procedures.

4. Testing

Black-box testing is a method used to evaluate the functionality of software without examining its internal structure or programming logic. This approach can be applied at various testing stages. After the system was implemented, analysis and evaluation were conducted to ensure that the system met user requirements (Utami Oktaviana & Gunawan, 2022). The testing was carried out on the system to detect potential errors in the design of the Inpatient Medical Record Borrowing Information System, as well as to evaluate its functional performance and verify that the system operated in accordance with the defined specifications.

Table 1. System Testing as Registration Officer

No.	Test Case	Testing Scheme	Expected Result	Actual Result	Conclusion
1	Login Page	Enter email address and password as Registration Officer, then click *Login*.	System displays the Dashboard Page.	Officer successfully logged in and redirected to the Dashboard.	Valid
2	Create Patient Data	Create and add new patient data, then click *Create*.	Patient data is saved in the database.	Patient data successfully created and stored in the database.	Valid

3	Edit Patient Data	Modify patient's ID number, then click *Save*.	Patient's ID number is successfully updated.	Patient data successfully updated and success notification shown.	Valid
4	Create Registration Data	Create and add new registration data, then click *Create*.	Registration data is saved in the database.	Registration data successfully created and stored in the database.	Valid
5	Edit Registration Data	Modify patient's room data, then click *Save*.	Room data is successfully updated.	Registration data successfully updated and success notification shown.	Valid

Table 2. System Testing as Medical Record Officer

No.	Test Case	Testing Scheme	Expected Result	Actual Result	Conclusion
1	Login Page	Enter email address and password as Medical Record Officer, then click *Login*.	System displays the Dashboard Page.	Officer successfully logged in and redirected to the Dashboard.	Valid
2	Create Loan Data	Create and add new loan data, then click *Create*. Afterward, print the loan receipt.	Loan data is successfully saved, and loan receipt can be printed.	Medical record loan data successfully saved with *loaned* status, loan receipt printed and stored in DB.	Valid
3	Edit Loan Data	Modify the doctor field, then click *Save*.	Doctor's data is successfully updated.	Loan data successfully updated and success notification displayed.	Valid
4	Loan Report Export	Open the Loan page to retrieve inpatient medical record loan data as a report, then click *Export*.	Notification appears to download in Excel/CSV format.	Excel/CSV file successfully downloaded and used as inpatient medical record loan report.	Valid

Based on the tables above, users acting as registration officers and medical record officers were tested using the black-box testing method, covering processes from login to every available menu. The results show that all system functions operated properly as expected.

5. Deployment

At this stage, the developed system can be implemented by users. The coding and design processes were carried out using Visual Studio Code with PHP as the programming language and MySQL as the database. The initial step involves logging in as a SIMRS user and inputting master data, as well as creating user accounts according to the required roles.

6. Review

At this stage, the design of the Inpatient Medical Record Loan Information System has been successfully implemented. The digitalization of the inpatient medical record loan process has made the system more efficient and effective, while also supporting the implementation of electronic medical records. However, some limitations remain, one of which is related to the printing of loan receipts.

CONCLUSION

Based on the findings at Assyifa Islamic Hospital, Sukabumi City, part of the inpatient medical record borrowing process—particularly for documents that have not yet been digitized-is still carried out conventionally using a borrowing expedition book. To address this issue, a web-based inpatient medical record borrowing information system was designed and developed using the Agile method, with Microsoft Visual Studio Code as the development environment, PHP as the programming language, and MySQL as the database.

The system has been tested and proven to facilitate staff in managing borrowing data, including searching, updating, storing, and generating reports. The digitization of the inpatient medical record borrowing process reduces the risk of document loss, misfiled records, and also lessens the workload of medical record officers. Furthermore, the system supports the workflow of medical record staff, from registration to reporting.

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