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Design and Implementation of a Java-Based Inpatient Information System for Hospitals as a Digitalization Solution for Medical Services

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Abstract

Hospitals are facilities that offer medical care to the public. One of the services provided is inpatient care. The process of finding beds and patient rooms can be time-consuming, leading to the development of the BedFinder application, a hospital inpatient information system application. In addition to searching for beds and patient rooms, the BedFinder application also allows for the addition of the number of beds and rooms. The BedFinder application is a desktop-based application developed using the agile methodology to adapt to user needs. Users can utilize this application on hospital computers and laptops to search for specific beds and patient rooms, as well as add to the number of beds and rooms. The BedFinder application was created based on the previously developed mockup designs. With the implementation of the BedFinder application, the process of searching for beds and patient rooms, as well as adding to the number of beds and rooms, becomes more efficient, thus increasing productivity.

Keywords: Hospital, inpatient care, java, prototype, interface.

1 INTRODUCTION

Hospital is one of the health institutions that has an important role in providing health services for the community. One of the services provided by the hospital is inpatient services, where patients can live in hospitals to get intensive care and better treatment.

In the implementation of inpatient services, there are various aspects that need to be considered by the hospital, one of which is coordination of the room. Coordination of the room in the hospital is one of the most important things, because it will affect the effectiveness and efficiency of the inpatient services provided. One of the challenges that is often faced by the hospital is difficulty in coordinating the availability of rooms, the number of patients being treated, and the schedule of family visits or people who come to visit the patient.

To overcome this problem, an effective and efficient solution is needed in managing inpatient services in hospitals. One solution that can be applied is to use a Java -based hospital inpatient information system application that is run on the admin computer. This application can help the admin coordinate the room and provide accurate and timely information systems for families or people who come to visit patients.

The use of information systems in the management of hospital medical records has become increasingly important and needed in maintaining the efficiency and accuracy of the health service process. In several previous studies, efforts have been made to develop a Java -based medical record management information system. For example, Ayuningrum et al. conduct a system approach in managing medical records at Mitra Sehat Hospital Situbondo. The study aims to improve efficiency

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and accuracy in managing medical records by utilizing a Java-based system (Ayuningrum, et. al., 2020). In addition, Cahyanto also applies web service technology to the medical record data information system at XYZ Hospital. This research provides an overview of the importance of using web service technology in facilitating the exchange of medical record information between systems, although in this study in the form of desktop applications (Cahyanto, 2018). Next, Haitami et al. developing a hospital medical record management information system using Java, which provides effective solutions in medical record management in hospitals (Haitami & Septiani, 2020). Laura Florentina Fresha et al. also reviewing a review of the medical record management system at Bina Kasih Hospital Pekanbaru in 2021, which provides insight into the implementation and success of the system (Silitonga & Supriatin, 2022). Another study, conducted by Widia et al., describing the use of Microsoft Visual Studio in the Correspondence Information System for Medical Records in Hospitals (Widia, et. al., 2021).

Sikiru and Oyekunle (2021) developed a web-based hospital management system focusing on enhancing operational efficiency. The system includes modules for patient management, staff administration, financial operations, and pharmaceutical inventory within an integrated platform. In a related study, Rahman (2022) designed a similar web-based hospital management system with an emphasis on a user-friendly interface and the integration of various hospital service modules. His research highlighted the need for systems capable of managing patient data, coordinating doctors' schedules, and maintaining centralized medical records to deliver faster and more accurate healthcare services.

Earlier, Haux (2004) conducted a strategic review of hospital information systems, stressing the importance of structured and integrated management within healthcare institutions. His work underscored key concepts, system architectures, and applicable strategies to support data management, enhance service quality, and improve operational performance.

More recently, Marbella, Akbar, and Setiawan (2024) designed and implemented a web-based patient management system with a particular focus on patient data integration. Their system aimed to address challenges in patient registration, medical record documentation, and service scheduling, while maintaining medical data security as a top priority. Although several studies have explored Java-based electronic medical record management systems, significant limitations and challenges remain in their application to the regulatory frameworks of psychiatric hospitals. These gaps highlight the need for further research to develop more comprehensive and reliable solutions.

Although many studies have examined the creation of a Java-based medical record management system, there are still standards and challenges that stand out in the case of applying this solution in the regulation of the real hospital. As large as previous research has focused on the specific components of note management, such as the storage of this shortage shows the need for further work that members of a more complete and capable solution.

However, although many previous studies have been conducted in the development of information systems in Java -based medical record management, there are still gaps and challenges in its application. Some studies only focus on certain aspects in managing medical records, while some others have not reached the optimal success rate. Therefore, further research is needed that can overcome deficiencies and optimize the application of Java -based medical record management information systems in hospitals.

This research aims to develop and implement the java-based applications of inpatient information systems based on a comprehensive and effective. This study will discuss various important aspects in managing medical records, including data storage, data collection, integration with other systems, and information security. Through the implementation of a good information system, it is expected that hospitals can improve operational efficiency, increase data accuracy, and improve health services to patients.

This research is based on a collection of literature that has been done previously. Some relevant related studies include research by Arif (2018), which examined the management of medical record

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archives at Aminah Hospital Tangerang, and Suraja (2019), which discussed the management of medical records at health service facilities. In addition, Irawan and Utama (2022) implemented the RAD (Rapid Application Development) development method and the Black Box test in the e-Archives administration. Taking into account the contribution of previous research and fixing existing deficiencies, this research is expected to make a significant contribution in the development of Java-based hospital inpatient information systems.

2 LITERATURE REVIEW

A. Inpatient Information System in Hospitals
Inpatient information system is one of the subsystems of the hospital information system that aims to manage administrative and medical data on patients undergoing inpatient treatment. This system includes recording patient identity, bed management (bed management), monitoring of maintenance status, to setting family visit schedules. Manual systems tend to cause various obstacles such as late data access, information inconsistencies, and low work efficiency (Haitami & Septiani, 2020).

B. Java as a Programming Language for Application Development
Java is an object -oriented programming language that is very popular in developing medium to large scale applications. Stable, safe, and flexible JAVA characteristics make it ideal for the development of hospital information system applications that demand reliability and scalability (Haitami & Septiani, 2020).

3 RESEARCH METHODOLOGY

The agile method is an approach or framework in the software development based on the principles of team collaboration, open communication, rapid adaptation to changes, and delivery of software iteratively and incrementally. Agile methods are used as an alternative to traditional software development methods that tend to be more rigid and formal, such as the waterfall method. The following are the stages in the agile model used in making Java-based hospital inpatient information system applications:

- **Requirements Analysis**
  At the needs analysis stage, the beginning of software development, where developers meet with clients to gather the requirements and understand the problems that this application wants to solve. At this stage, the main goal is to ensure that all application needs needed by the client are clearly understood by the developer. In the Java -based hospital inpatient information system application, developers must understand the needs needed by the admin and also the family or people who come to visit the patient.
- **Design**
  At the design stage, after collecting requirements, the next stage is to design architecture and system design. At this stage, the developer will design the user interface, selecting programming languages, database design, and system infrastructure. Developers must ensure that system design has been understood by all related parties.
- **Implementation**
  At the implementation phase, after designing system design, developers will start implementing the program code using the Java programming language. At this stage, the developers must pay attention that the program code must be in accordance with the design that was created in the previous stage.
- **Testing**
  In the testing stage, after the program code is completed, the developers must test the applications that have been made. The purpose of this test is to ensure that the application runs as desired by the client and there are no errors in the system.

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4 RESULTS AND DISCUSSION

The purpose of making an interface in the Inpatient Hospital - Java based Hospital Inpatient Information System Application Research is to describe the expected user interface of the hospital inpatient information system application. The interface also aims to get the initial feedback from the user and related parties, so that improvements and adjustments can be made before entering further development stages. The following is the display of the interface that will be created a hospital inpatient information system application that will be called a BedFinder.

4.1 Activity Diagram

Activity Diagram aims to describe the workflow or sequence of activities in the process of managing Java -based hospital medical records. Activity diagrams use elements such as activities, decisions, lines, and liaison to visualize the steps that must be taken in managing medical records, there are eight swimlane in the application of inpatient information system. The main goal is to ensure an efficient and accurate workflow in managing medical records, thereby improving health services to patients. The following is an activity diagram in detail the components and relevant examples to help understand the use of this diagram in practice, which can be seen in Figure 1.

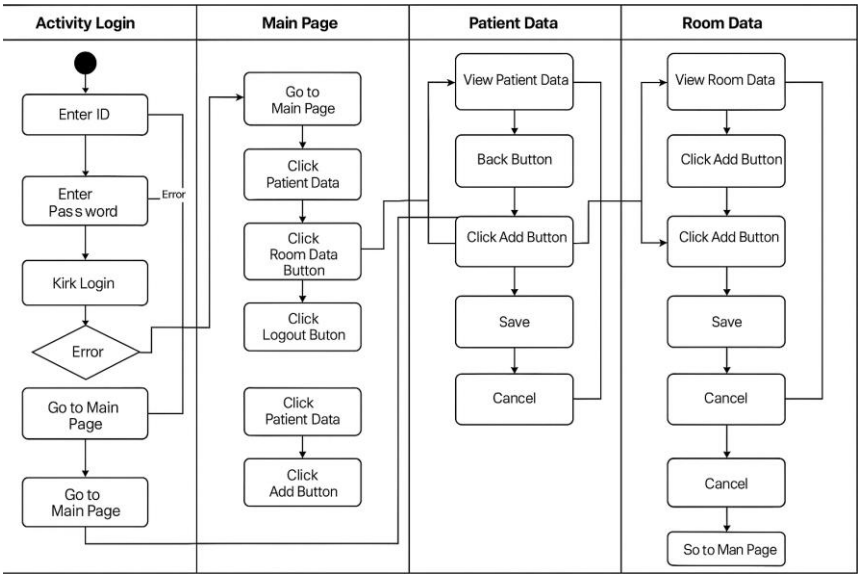

Figure 1. BedFinder Activity Diagram.

4.2 Design

4.2.1 Database Design

The database aims to explain the concepts and roles in the Java -based hospital inpatient information system. The database acts as a place to store integrated medical record data, as well as the need for efficient structures and designs to support accurate and easily accessible data management. By understanding the appropriate database and design concepts, hospitals are expected to be able to build a reliable, safe and efficient inpatient information system in managing medical records, thereby improving the quality of health services and patient satisfaction. Design of BedFinder's database can be seen in Figure 2.

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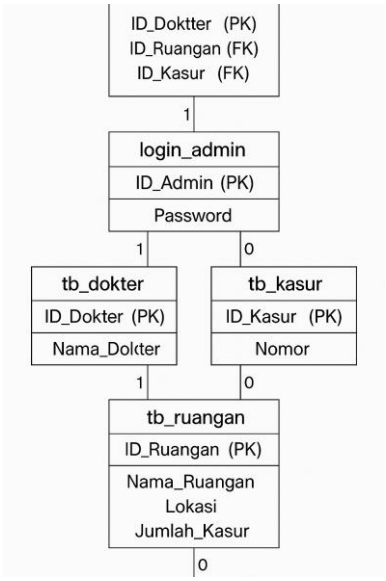

Figure 2. BedFinder's Database.

4.2.2 User Interface Design

The purpose of making an interface in the Java Inpatient Hospital -based Hospital Inpatient Information System Application Research is to describe the expected user interface of the hospital inpatient information system application. The interface also aims to get the initial feedback from the user and related parties, so that improvements and adjustments can be made before entering further development stages. The following is the display of the interface that will be created a hospital inpatient information system application that will be called a BedFinder. Figure 3 shows the login page interface of the hospital inpatient information system application, where users are required to enter their username and password to access the system securely.

Figure 3. Login Page User Interface.

Figure 4 displays the main page interface of the hospital inpatient information system application, which provides users with access to the primary features and navigation menus for managing inpatient data.

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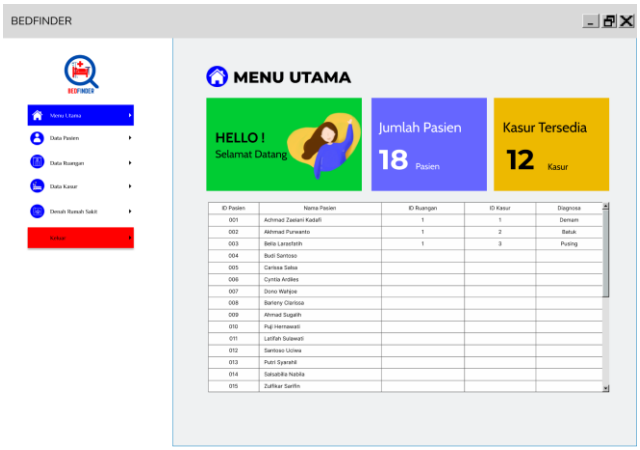

Figure 4. Main Page User Interface.

Figure 5 presents the patient data page interface of the hospital inpatient information system application, which facilitates the structured recording, retrieval, and management of patient information to support accurate and efficient healthcare services.

Figure 5. Patient Data Page User Interface.

Figure 6 illustrates the room data page interface of the hospital inpatient information system application, which provides menu options for viewing room data and inputting new room information, thereby enabling systematic management of room availability, assignments, and classifications to optimize inpatient accommodation planning.

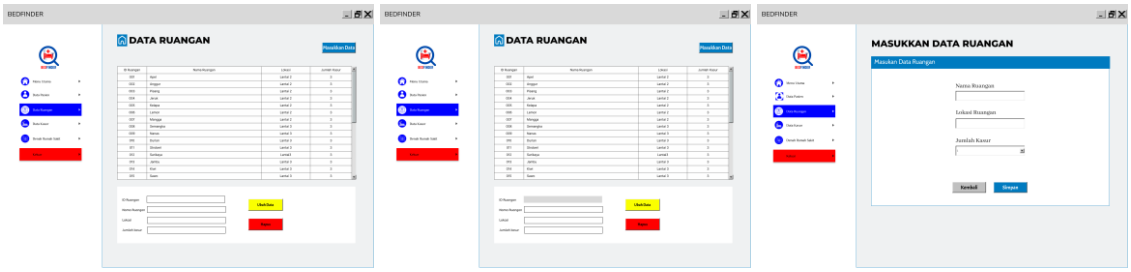

Figure 6. Room Data Page User Interface.

Figure 7 depicts the bed data page interface of the hospital inpatient information system application, which allows users to view existing bed records and input new bed information, thereby supporting efficient allocation and management of inpatient facilities.

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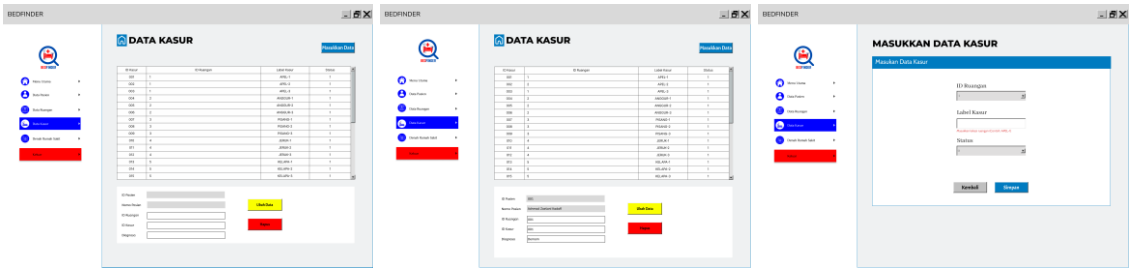

Figure 7. Bed Data Page User Interface.

Figure 8 presents the hospital layout page interface of the hospital inpatient information system application, which displays the hospital's floor plan to provide a visual representation of room locations and facilitate efficient navigation and facility management.

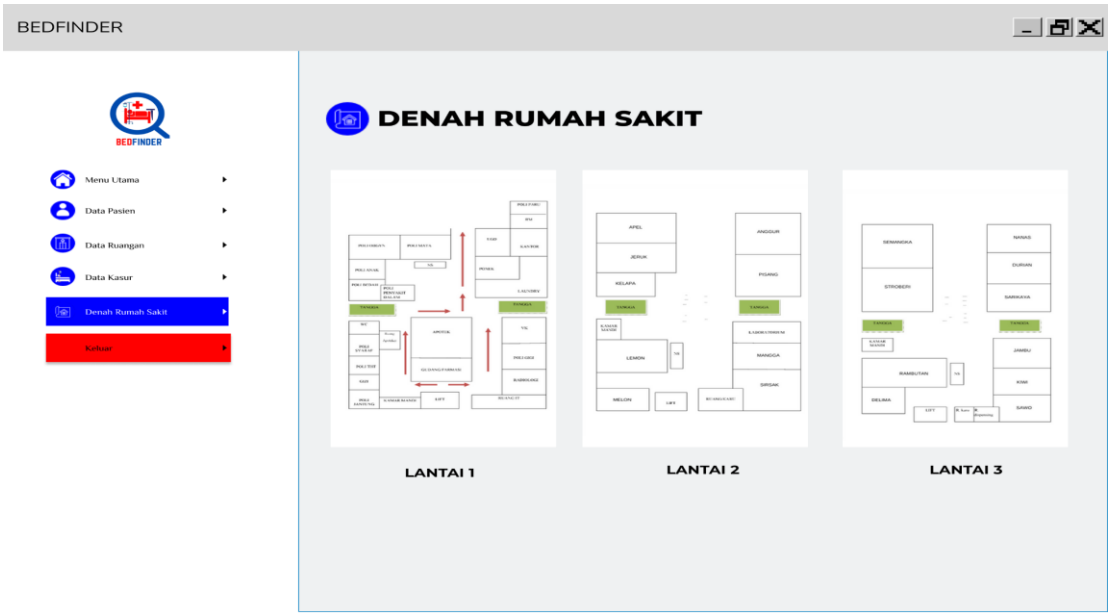

Figure 8. Hospital Layout Page User Interface.

4.3 BedFinder Implementation

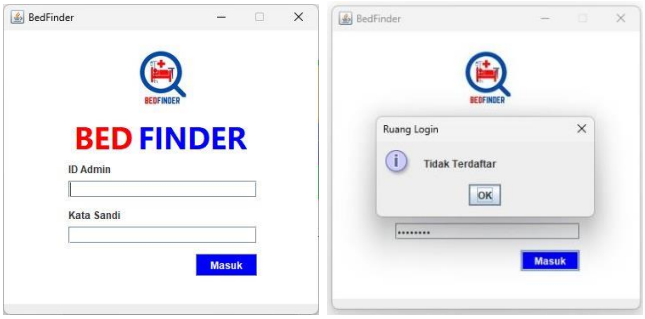

Figure 9. Login Page.

The figure 9 shows the login page of the application, where users can input their Admin ID and password. After clicking the "Login" button, the user will be directed to the main menu if the

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credentials are correct. However, if the Admin ID or password is entered incorrectly, a notification will appear indicating that the ID and password do not match.

Figure 10. Main Page.

After logging in, several menu options are available, one of which is the main page. On this page, users can view information such as the total number of patients, available beds, and a table containing patient ID, patient name, room ID, bed ID, and diagnosis.

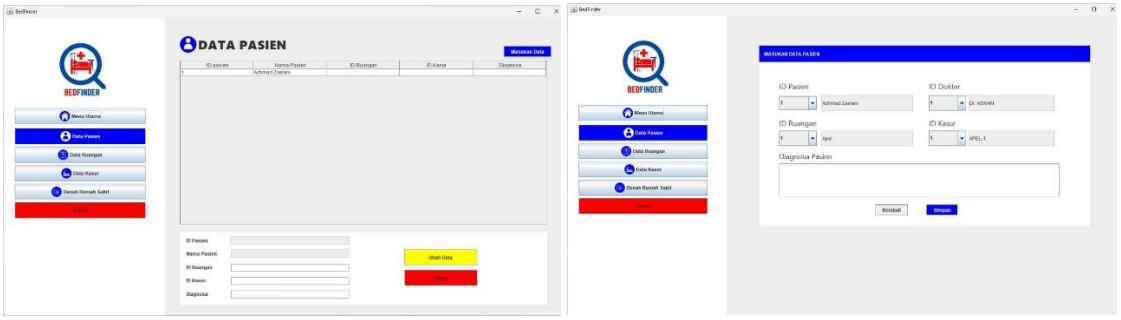

Figure 11. Patient Data Page.

Figure 11 shows mocking or patient data interface. Paya this page, ketka users choose patients from the table, they can modify the room ID, the written place, and diagnosis. In addition to editing, users can delete patient data after the patient is no longer accepted. However, this action does not permanently delete records of inpatients is suggested by the hospital but will no longer appear in the BedFinder application. In addition, the user eliminates the option to drain the information of new patients entering details such as patient IDs, room IDs, doctor IDs, bed IDs, and diagnoses.

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Figure 12. Room Data Page.

Figure 12 presents mocking room page data. This interface features a table that includes a room ID, room name, floor location, and the number of beds. From this page, users can add new entries, and update or delete existing room data. In the room data input section, users can enter details such as room IDs, room names, room labels, and number of beds.

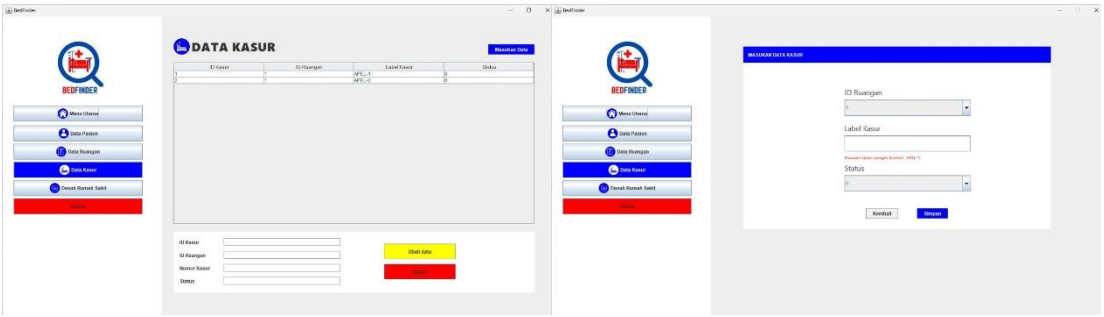

Figure 13. Bed Data Page.

Figure 13 displays the Mock-Up Data Bed page. This page presents a table that contains information such as bed IDs, room IDs, bed labels, and status. From here, users can add new bed notes, as well as update or delete existing ones. Data Bed Input Form allow users to enter details including room IDs, bed labels, and status.

Figure 14. Hospital Layout Page.

Figure 14 presents a mock-up of the Hospital Layout page, which illustrates the hospital's three floors. The primary purpose of this page is to provide precise spatial information, assisting users in locating the specific rooms where patients are admitted.

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4.4 Test Identification

Black box testing is a Luna device testing method that focuses on evaluating the usefulness and function of an application. The method of all related subsistence, including the user interface and user experience (UI/UX), database, dependencies, and integrated systems, without requiring enlargement of knowledge about internal codes. Examiners conducted on the applications of Ruci Sangan -based inpatient information systems are based on the UI/UX function and application features that were previously determined in the specifications of the Lamkatana device. A total of 23 cases of tests were executed using the black box testing method.

Table 1. Black Box Testing of the Hospital Inpatient Information System Application.

No	Page	Actor Action	Correct System Response	Incorrect System Response	Compliant	Non-Compliant
1	Login	Enter ID and Password	Redirected to the main menu	Remain on the login page	✓	
2	Main Menu	Sort Patient ID	Patient IDs sorted in order	Patient IDs not sorted	✓	
3	Main Menu	Sort Patient Name	Patient Names sorted in order	Patient Names not sorted	✓	
4	Main Menu	Sort Room ID	Room IDs sorted in order	Room IDs not sorted	✓	
5	Main Menu	Sort Bed ID	Bed IDs sorted in order	Bed IDs not sorted	✓	
6	Main Menu	Sort Diagnosis	Diagnoses sorted in order	Diagnoses not sorted	✓	
7	Patient Data Menu	Enter new patient data	Redirected to patient data entry page	Remain on Patient Data page	✓	
8	Patient Data Menu	Edit patient data	Successfully updated data	Failed to update data	✓	
9	Patient Data Menu	Delete patient data	Successfully deleted data	Failed to delete data	✓	
10	Patient Data Entry Menu	Save patient data	Successfully saved patient data	Failed to save patient data	✓	
11	Patient Data Entry Menu	Return to Patient Data page	Successfully returned to Patient Data page	Failed to return to Patient Data page	✓	
12	Room Data Menu	Enter new room data	Redirected to room data entry page	Remain on Room Data page	✓	
13	Room Data Menu	Edit room data	Successfully updated data	Failed to update data	✓	
14	Room Data Menu	Delete room data	Successfully deleted data	Failed to delete data	✓	

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No	Page	Actor Action	Correct System Response	Incorrect System Response	Compliant	Non-Compliant
15	Room Data Entry Menu	Save room data	Successfully saved room data	Failed to save room data	✓	
16	Room Data Entry Menu	Return to Room Data page	Successfully returned to Room Data page	Failed to return to Room Data page	✓	
17	Bed Data Menu	Enter new bed data	Redirected to bed data entry page	Remain on Bed Data page	✓	
18	Bed Data Menu	Edit bed data	Successfully updated data	Failed to update data	✓	
19	Bed Data Menu	Delete bed data	Successfully deleted data	Failed to delete data	✓	
20	Bed Data Entry Menu	Save bed data	Successfully saved bed data	Failed to save bed data	✓	
21	Bed Data Entry Menu	Return to Bed Data page	Successfully returned to Bed Data page	Failed to return to Bed Data page	✓	
22	Hospital Layout Menu	Redirected to Hospital Layout page	Display hospital layout	Hospital layout not displayed	✓	
23	Logout	Redirected to login page	Display login page	Login page not displayed	✓	

5 CONCLUSION

Based on a comprehensive analysis of the study results, it can be concluded that the BedFinder application plays a significant role in strengthening coordination mechanisms within hospitals. The findings demonstrate that the application effectively transforms inpatient room availability management into a more efficient, responsive, and accurate process by integrating real-time information. The application possesses advanced capabilities to monitor, track, and manage the status of inpatient rooms and beds, thereby enabling hospital management to obtain up-to-date insights into patient distribution. This, in turn, supports the strategic allocation of essential healthcare resources, including medical equipment and personnel, with a high level of accuracy, thereby minimizing the risk of misallocation and ensuring optimal utilization of hospital infrastructure.

Additionally, BedFinder introduces a structured framework for scheduling patient visits. This feature systematically organizes visitation patterns to reduce overcrowding, support disease prevention protocols, and create a conducive environment for patient recovery and well-being. The integrated scheduling system further strengthens infection control measures and contributes to enhancing the overall experience of both patients and visitors.

Furthermore, this study highlights the role of BedFinder in reinforcing healthcare governance by integrating room coordination, patient flow management, and visitation scheduling into a unified digital platform. Such integration streamlines internal workflows while aligning with key principles of healthcare service management efficiency, patient-centered care, and sustainable support through digital technology.

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In conclusion, the findings confirm that BedFinder represents a relevant, practical, and effective technological solution to address the challenges of modern healthcare services, particularly in managing critical patient visits. Its implementation provides a strategic pathway toward improved hospital governance, optimized resource management, and enhanced quality and safety of healthcare delivery.

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