

Design and development of an integrated payment information system for maternal and child hospitals

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ABSTRACT

Purpose: to design and develop an integrated web-based payment information system for maternal and child hospitals to support patient payment transactions more efficiently, accurately, and systematically.

Method: this study employed the research and development (R&D) method. The development process consisted of problem identification, data collection through observation, interviews, and documentation; system requirements analysis; system design using UML; web-based system development; system testing using black-box testing; and system implementation.

Findings: the study developed a web-based integrated payment information system for maternal and child hospitals. Black-box testing across 30 test scenarios achieved a 100% success rate, indicating that all system functions operated correctly and effectively supported hospital payment administration.

Implications: the developed system improves administrative efficiency, payment accuracy, and financial transparency in hospital services, while supporting the digital transformation of healthcare management in maternal and child hospitals.

Originality: lies in the development of an integrated web-based payment information system that combines patient data, medical records, medication management, billing, payment processing, and financial reporting into a single platform specifically designed for maternal and child hospitals.



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Introduction

The development of information technology has driven digital transformation across sectors, including healthcare (Iyanna et al., 2022). Hospitals, as healthcare institutions, are required to provide fast, precise, accurate, and transparent services to meet the increasingly complex needs of the community (Avinash & Joseph, 2024;

Varnosfaderani & Forouzanfar, 2024). To support this quality of service, the implementation of information systems is a crucial factor that can improve operational efficiency, accelerate workflows, and support more effective decision-making (Biswas et al., 2024; Hamdat et al., 2024). One aspect that plays a strategic role in hospital operations is the management of patient administration and payments (Jani & Chaudhary, 2023). An integrated payment system not only serves as a means of recording financial transactions but also plays a key role in maintaining data accuracy, service transparency, and the sustainability of hospital financial management.

A maternal and child hospital is a healthcare facility that provides services for mothers and children, including prenatal care, childbirth, postpartum care, immunizations, child health checks, and other services. The high frequency of daily transactions, both self-payment transactions and payments through health insurance programs, requires an effective and efficient payment management system. However, in practice, some hospitals still manage payment processes manually or use stand-alone applications that are not yet integrated with patient registration, medical records, pharmacy, laboratory, or insurance claims management systems. This situation has the potential to cause problems such as data duplication, billing errors, payment delays, difficulties tracking transactions, and suboptimal financial reporting.

Various studies have demonstrated the importance of implementing information systems in improving service quality and hospital operational efficiency. Marbella et al. (2024) explained that a web-based medical record information system can improve patient data management and organization. Sanjuluca (2022); Shittu et al. (2024) emphasized that the hospital management information system plays a crucial role in supporting operational processes and managerial decision-making. Laurenxius et al. (2025) found that implementing an electronic medical record system can improve the efficiency of patient service time. Furthermore, Kuswari et al. (2024); Rifial (2024) emphasized the importance of designing an integrated hospital information system to improve service quality and data management effectiveness. From a financial perspective, Bhuiyan et al. (2025) demonstrated that digital payment systems are more efficient than manual payment systems, while Nkrumah et al. (2022) revealed that information system readiness is a crucial factor in supporting healthcare claims management.

Although previous studies have discussed hospital information systems, electronic medical records, referral systems, and hospital financial management, research specifically focused on the design and development of integrated payment information systems in maternal and child hospitals remains relatively limited. Most studies only discuss information systems in general or focus on one specific function without integrating the entire payment process, from patient registration and medical service recording to billing management and payment verification to financial reporting, into one integrated system. This condition indicates a research gap related to the development of payment information systems that can accommodate the characteristics of services and financial administration needs in maternal and child hospitals.

The novelty of this research lies in the design and development of an integrated payment information system that connects all healthcare transaction processes in a single web-based platform. The developed system not only serves as a payment recording medium but also integrates patient data, medical services, billing management, payment verification, claims management, and real-time financial reporting. Thus, this system is expected to improve operational efficiency, reduce administrative errors, increase the accuracy of transaction data, and support

transparency in hospital financial management. This research aims to design and develop an integrated payment information system for a maternal and child hospital that supports fast, accurate, and structured payment transaction processes. In addition, this research aims to develop a system that simplifies payment data management, improves financial administration efficiency, and provides accurate information for hospital management's reporting and decision-making needs.

This research is important because the payment system is a key component influencing service quality, patient satisfaction, and the sustainability of hospital operations. Suboptimal payment management can lead to service delays, inconsistencies in financial data, and reduce the effectiveness of hospital administration. Therefore, the development of an integrated payment information system is a strategic necessity to support digital transformation and improve the quality of healthcare services in maternal and child hospitals. The expected contributions of this research include theoretical and practical contributions. Theoretically, this research is expected to enrich studies on the development of payment information systems in the healthcare sector, particularly in maternal and child hospitals. Practically, the results of this study can serve as a reference for hospital managers, information system developers, and policymakers in designing and implementing an integrated payment system that can improve operational efficiency, financial accountability, and the quality of service to patients.

Method

This study uses the research and development (R&D) method to produce a Payment Information System for maternal and child hospitals that can improve the efficiency, accuracy, and quality of patient payment administration. The R&D method was chosen because it not only focuses on product development but also on testing and evaluation to ensure the resulting system meets user needs and solves problems encountered in the field. The development model used in this study is the Borg and Gall model, which has been adapted to the needs of information system development. This model was chosen because it provides a systematic approach from identifying needs to product implementation. In this study, the development stages include identifying potential and problems, data collection, system requirements analysis, system design, system development, system testing, and system implementation.

The first stage is identifying potential and problem areas, an activity that assesses the actual conditions of the payment process at the maternal and child hospital. At this stage, observations were made of the patient payment flow, transaction data management, payment recording processes, and financial reporting. The identification results revealed various problems, including manual administrative processes, data duplication, delays in transaction recording, and difficulties in preparing payment reports. The second stage is data collection. Research data were obtained through observation, interviews, and documentation. Observations were conducted to understand the hospital's payment business processes. Interviews were conducted with administrative staff, the finance department, and management to gather information on system requirements and the obstacles encountered. Documentation studies were conducted by collecting documents related to payment transactions, financial reports, and hospital administrative procedures.

The third stage is system requirements analysis. At this stage, the system's functional and non-functional requirements are analyzed. Functional requirements analysis includes patient data management, healthcare service recording, billing management, payment processing, proof-of-payment printing, and transaction report

preparation. Meanwhile, non-functional requirements include data security, usability, system access speed, and system reliability in supporting hospital operational activities. The fourth stage is system design. At this stage, a system design is created, including database design, entity relationship diagrams, and system models using unified modeling language (UML), such as use case diagrams. This design aims to provide a comprehensive overview of the system's structure and working mechanisms.

The fifth stage is product development (system development). Based on the design results, the payment information system was then developed using web-based technology. The development process includes creating patient data management modules, payment transaction management, bill recording, payment verification, and financial reporting integrated into a single system. The sixth stage is system testing. Testing is conducted to ensure that all system functions operate in accordance with predetermined requirements. The testing method used is black-box testing, which focuses on the system's functions and outputs without regard to the program code structure. Testing is conducted on each key feature to ensure the system can process data correctly, produce accurate information, and operate as intended for users.

The final stage is system implementation, which involves applying the developed payment information system to the hospital's operational environment. At this stage, user testing is conducted to determine the system's level of acceptance and ease of use. The implementation results are then evaluated to identify the system's strengths and weaknesses as a basis for further development. Through these stages, it is hoped that the developed payment information system will address payment administration issues at the maternal and child hospital, improve workflow efficiency, minimize transaction recording errors, and support the provision of timely, precise, and accurate financial information.

Results and discussion

Database design results

Database design is a crucial step in developing the maternal and child hospital payment information system. The database is designed to support integrated data management, ensuring that all administrative, service, and payment processes are effective, efficient, and accurate. The database design is based on the system requirements analysis obtained through observation, interviews, and documentation studies within the hospital environment. The database structure is developed using a relational model consisting of several tables interconnected by primary keys (PK) and foreign keys (FK). The relationships between tables are designed to support the management of patient data, doctor data, polyclinic data, medication data, medical records, payment transactions, and system user management. With these relationships between tables, the system can integrate healthcare service data with payment administration data in real time, thereby minimizing data duplication and transaction recording errors.

The database in this system consists of eight main tables: Pasien, Dokter, Poliklinik, Obat, Rekam_Medis, Detail_Obat, Pembayaran, and User. Each table has a different function according to the system's needs. The Pasien table stores patient identity information, the Dokter table stores medical personnel data, the Poliklinik table stores service unit information, and the Obat table manages data on the hospital's drug inventory. Furthermore, the Rekam_Medis table stores data on examination results and medical services received by patients. The Detail_Obat table is used to record drugs

administered to patients based on the medical record created. Meanwhile, the Pembayaran table manages all patient payment transactions, including recording the total bill, payment amount, change, and payment status. The User table is used to manage system user access rights based on their respective roles, such as administrator, cashier, and doctor.

This structured, integrated database design is expected to support optimal system operations, improve data management accuracy, expedite administrative processes, and deliver the information required by hospital management quickly and accurately. The database table design used in the maternal and child hospital payment information system is described below.

Table 1 pasien

Field	Data type	Description
id_pasien	INT (PK)	Patient ID
no_identitas	VARCHAR(20)	Patient identification number
nama_pasien	VARCHAR(100)	Patient name
jenis_kelamin	ENUM('L','P')	Gender
Alamat	TEXT	Address
no_telepon	VARCHAR(15)	Telephone number
created_at	TIMESTAMP	Date of Entry

Table 2 dokter

Field	Data type	Description
id_dokter	INT (PK)	Doctor ID
nama_dokter	VARCHAR(100)	Doctor name
Spesialis	VARCHAR(100)	Specialization
Alamat	TEXT	Address
no_telepon	VARCHAR(15)	Phone number
created_at	TIMESTAMP	Date entered

Table 3 poliklinik

Field	Data type	Description
id_poli	INT (PK)	Clinic ID
nama_poli	VARCHAR(100)	clinic name
Gedung	VARCHAR(50)	building location
created_at	TIMESTAMP	entry date

Table 4 obat

Field	Data type	Description
id_obat	INT (PK)	Drug ID
nama_obat	VARCHAR(100)	Drug name
Keterangan	TEXT	Drug description
Stok	INT	Stock quantity
Harga	DECIMAL(12,2)	Drug price
created_at	TIMESTAMP	Entry date

Table 5 rekam_medis

Field	Data type	Description
id_rekam_medis	INT (PK)	Medical record ID
id_pasien	INT (FK)	Patient relationship
id_dokter	INT (FK)	Doctor relationship
id_poli	INT (FK)	Polyclinic relationship
Keluhan	TEXT	Patient complaint
Diagnosa	TEXT	Diagnosis result
Tindakan	TEXT	Medical procedure
tanggal_periksa	DATE	Examination date

Table 6 detail_obat

Field	Data type	Description
id_detail_obat	INT (PK)	Drug detail ID
id_rekam_medis	INT (FK)	Medical record ID
id_obat	INT (FK)	Drug ID
Jumlah	INT	Number of drug
Subtotal	DECIMAL(12,2)	Total price

Table 7 pembayaran

Field	Data type	Description
id_pembayaran	INT (PK)	Payment ID
kode_pembayaran	VARCHAR(30)	Transaction code
id_pasien	INT (FK)	Patient
id_rekam_medis	INT (FK)	Medical record
total_bayar	DECIMAL(12,2)	Total bill
jumlah_bayar	DECIMAL(12,2)	Amount paid
Kembalian	DECIMAL(12,2)	Refund
tanggal_bayar	DATE	Payment date
Status	ENUM('Lunas','Belum Lunas')	Payment status

Table 8 user

Field	Data type	Description
id_user	INT (PK)	User ID
nama_user	VARCHAR(100)	User name
Username	VARCHAR(50)	Username
Password	VARCHAR(255)	Password hash
Level	ENUM('Admin','Kasir','Dokter')	Access rights

Entity relationship diagram (ERD) design results

An entity relationship diagram (ERD) is a visual representation used to illustrate the database structure and relationships between entities in the maternal and child hospital payment information system. The ERD design is based on the results of the system requirements analysis conducted in the previous stage. This diagram provides an overview of the data flow, entity relationships, and data storage mechanisms used in the system. In the developed system, several main entities support the patient service and payment process, namely the Pasien, Dokter, Poliklinik, Obat, Rekam_Medis, Detail_Obat, Pembayaran, and User entities. Each entity has attributes that represent the information required by the system, while relationships between entities are established using primary and foreign keys to maintain data integrity.

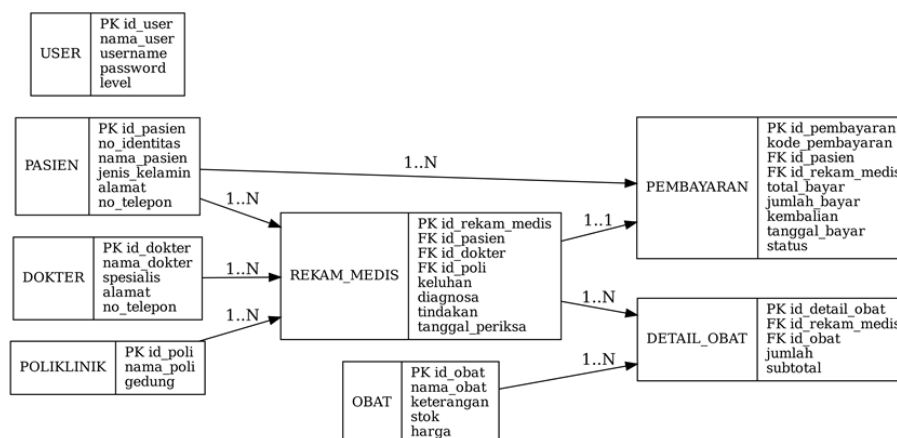


Figure 1 entity relationship diagram (ERD)

The designed ERD shows that patient data is connected to medical records and payment data. In contrast, doctor and polyclinic data are related to the patient examination process recorded in the medical record. In addition, medical records are linked to medication data via the drug detail entity, which records medication use at each examination. All patient payments are recorded in the payment entity integrated with patient data and medical records. The user entity manages system user access rights based on their roles. With this ERD design, the database structure is built to be more organized, reduce data redundancy, and support effective, integrated information management. The entity relationship diagram (ERD) design for the maternal and child hospital payment information system can be seen in Figure 1.

Use case diagram design results

A use case diagram is a diagram in the unified modeling language (UML) that describes the interactions between users (actors) and the system being developed. This diagram provides an overview of the main functions available in the maternal and child hospital payment information system and the access rights of each user in carrying out business processes within the system. A Use Case Diagram helps clarify the system's functional requirements by showing the relationships between actors and the services provided by the system. In the maternal and child hospital payment information system being developed, three main actors interact with the system: Admin, Doctor, and Cashier. Admin has access rights to manage master data, including patient, doctor, polyclinic, and drug data, and to view financial reports. Doctors play a role in managing patients' medical records, which include recording examination results, diagnoses, and medical procedures. Meanwhile, the Cashier is responsible for managing the patient payment process, printing proof of payment, and viewing payment transaction reports.

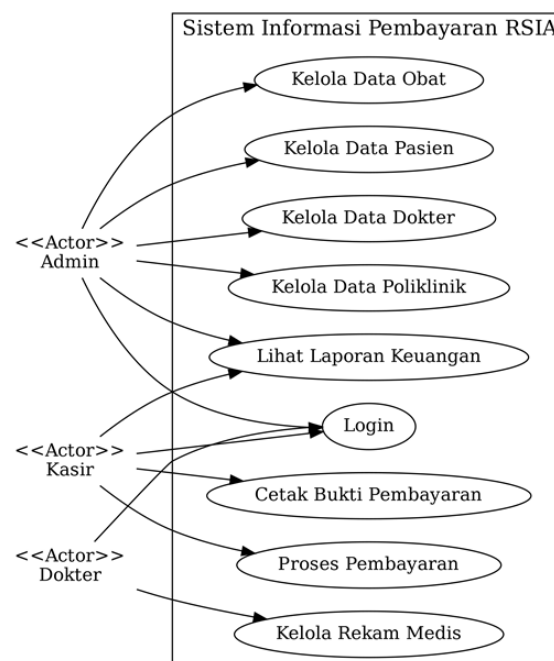


Figure 2 use case diagram

Before accessing the available features, each user must log in for authentication and system security. After successfully logging in to the system, each actor can perform functions according to their specified access rights. The relationship between the actors

and the system functions is depicted in the use case diagram, thus providing a comprehensive overview of the functional requirements of the maternal and child hospital payment information system. Based on the results of the system requirements analysis, the designed Use Case Diagram shows the interaction between actors and various features available in the system. The use case diagram for the maternal and child hospital payment information system is shown in Figure 2.

Results of system implementation

The system implementation aims to apply the design results to an application that users can use to support the administration and payment processes at the maternal and child hospital. The developed system is web-based, enabling easy access from network-connected devices, and supports integrated data management. The system implementation results include several main interfaces, tailored to users' needs and access rights. These interfaces include the Login page as a means of user authentication, the Dashboard as the main page that displays summary system information, the Patient Data page for managing patient information, the Doctor Data page for managing medical personnel data, the Polyclinic Data page for managing health service units, the Drug Data page for managing drug information, and the Payment page used to manage patient payment transactions. Each page is designed with a simple, easy-to-use (user-friendly) display and can support user work processes effectively and efficiently. The results of implementing the maternal and child hospital payment information system interface are shown in the following images.

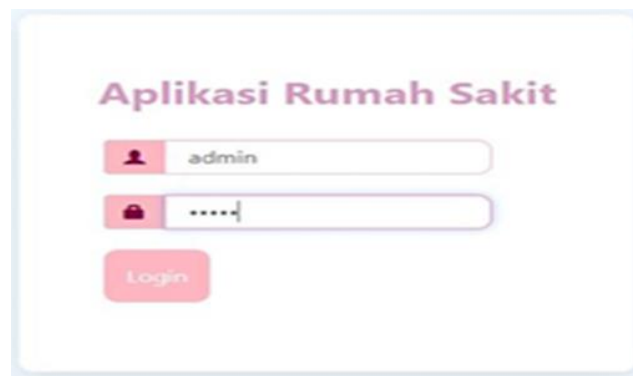


Figure 3 login page

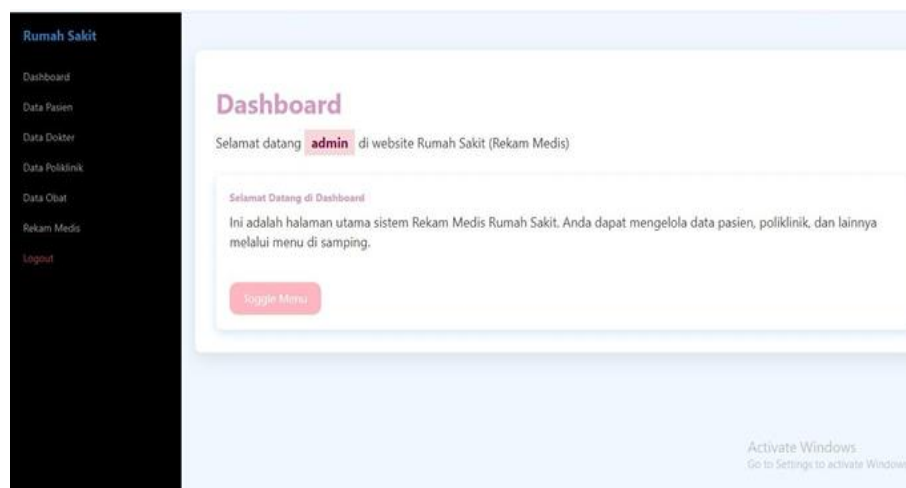


Figure 4 dashboard page

Rumah Sakit		Pasien				
Dashboard		Data Pasien				
Data Pasien		Refresh + Tambah Pasien Import Pasien				
Data Dokter		PDF Print CSV Excel Copy				
Data Poliklinik						
Data Obat						
Rekam Medis						
Logout						
		Nomor Identitas	Nama Pasien	Jenis Kelamin	Alamat	No. Telepon
		0123456789012345	Rina Ayu	Perempuan	Jl. Anggrek No. 9, Bali	090123456789
		1234567890123456	Ahmad Taufik	Laki-laki	Jl. Merdeka No. 5, Bukittinggi	081234567890
		2345678901234567	Siti Aisyah	Perempuan	Jl. Raya No. 22, Padang	082345678901
		317102198409060058	Dian Pratiwi	Perempuan	Jl. Raya No. 77, Padang Panjang	087812345678
		317102198501150021	Andi Setiawan	Laki-laki	Jl. Merdeka No. 45, Bukittinggi	081234567890
		317102198512300022	Budi Santoso	Laki-laki	Jl. Cendana No. 34, Solok	085123456789
		317102199012110032	Rizki Maulana	Laki-laki	Jl. Alamsyah No. 9, Payakumbuh	082245678910
		3456789012345678	Budi Santoso	Laki-laki	Jl. Kemenangan No. 11, Jakarta	083456789012
		4567890123456789	Lestari Dewi	Perempuan	Jl. Sukarno Hatta No. 8, Medan	084567890123
		5678901234567890	Fajar Prasetya	Laki-laki	Jl. Pemuda No. 3, Yogyakarta	085678901234

Figure 5 patient data page

Rumah Sakit		Dokter				
Dashboard		Data Dokter				
Data Pasien		Show 10 entries Search: + Tambah Dokter				
Data Dokter						
Data Poliklinik						
Data Obat						
Rekam Medis						
Logout						
		NO.	NAMA DOKTER	SPECIALIS	ALAMAT	NO. TELEPON
		1.	Dr. Harris Ardanto, Sp.THT	Telinga, Hidung, Tenggorokan	Jl. Raya No. 15, Padang	085323456733
		2.	Dr. Rizki Maulana, Sp.PD	Penyakit Dalam	Jl. Alamsyah No. 9, Payakumbuh	082245678910
		3.	Dr. Ahmad Rifal, Sp.UM	Spesialis Umum	Jl. Merdeka No. 19, Bukittinggi	081234567890

Figure 6 doctor data page

Rumah Sakit		Poliklinik			
Dashboard		Data Poliklinik			
Data Pasien					
Data Dokter					
Data Poliklinik					
Data Obat					
Rekam Medis					
Logout					
		No.	Nama Poli	Gedung	
		1.	Poli Kulit dan Kelamin	Gedung D, Lantai 3	
		2.	Poli Gigi	Gedung C, Lantai 1	
		3.	Poli Anak	Gedung B, Lantai 2	
		4.	Poli Umum	Gedung A, Lantai 1	
		5.	Poli Penyakit Dalam	Gedung E, Lantai 2	

Figure 7 polyclinic data page

No.	Nama Obat	Keterangan
1.	Paracetamol	Obat demam
2.	Amoxicillin	Obat antibiotik untuk infeksi bakteri
3.	Vitamin C	Suplemen untuk meningkatkan daya tahan tubuh

Figure 8 drug data page

NO	KODE	NAMA PASIEN	TOTAL	BAYAR	KEMBALIAN	TANGGAL	STATUS	AKSI
1.	PB-20250505-001	Jeni	Rp 300	Rp 300	Rp 0	05-05-2025	Lunas	
2.	PB-20250505-002	Nurjannah	Rp 250	Rp 300	Rp 50	30-04-2025	Lunas	

Figure 9 payment data page

System test results

After the system design and implementation process is complete, the next stage is system testing to ensure that all developed functions run as intended to meet user needs and established specifications. Testing is a crucial stage in system development because it aims to identify errors, verify system functionality, and ensure the system can deliver results in accordance with development objectives. In this study, the testing method used is black-box testing. This method is carried out by testing each system function based on the input and output produced without regard to the structure or program code used. Testing focused on the system's main functions, including the login process, patient data management, doctor data management, polyclinic data management, drug data management, payment transactions, and payment report generation.

Each module was tested using various test scenarios to ensure the system correctly receives input, processes data as needed, and produces accurate output. The test results were then compared with expected results to determine the system's functional efficacy. Based on testing, all features of the maternal and child hospital payment information system met user needs and functioned properly without significant errors. The results of the black-box testing for each system module are shown in the following table.

Table 9 login page test results

Nu.	Scenario	Input data	Expected results	Results
1	Login successful	Username and password are correct	The system displays the dashboard	Valid
2	Invalid username	Username is incorrect	The system displays a login failed message	Valid
3	Invalid password	Password is incorrect	The system displays a login failed message	Valid
4	Empty field	Username/password is blank	The system displays a warning	Valid

Table 10 patient data page test results

Nu.	Scenario	Input data	Expected results	Results
1	Adding patient data	Complete data	Data saved to database	Valid
2	Adding data without a patient name	Blank name	System rejects save	Valid
3	Changing patient data	New data	Data updated successfully	Valid
4	Deleting patient data	Select patient data	Data deleted successfully	Valid
5	Searching for a patient	Patient name	Patient data found	Valid

Table 11 results of testing the doctor data page

Nu.	Scenario	Input data	Expected results	Results
1	Adding doctor data	Complete data	Data saved	Valid
2	Changing doctor data	New data	Data updated successfully	Valid
3	Deleting doctor data	Doctor data	Data deleted successfully	Valid
4	Searching for a doctor	Doctor name	Doctor data found	Valid

Table 12 results of testing the polyclinic data page

Nu.	Scenario	Input data	Expected results	Results
1	Adding a polyclinic	Complete data	Data saved	Valid
2	Changing a polyclinic	New data	Data updated successfully	Valid
3	Deleting a polyclinic	Polyclinic data	Data deleted successfully	Valid

Table 13 drug data page test results

Nu.	Scenario	Input data	Expected results	Results
1	Adding a drug	Complete data	Data saved	Valid
2	Adding an out-of-stock drug	Out of stock	System rejected the save	Valid
3	Changing drug data	New data	Data updated successfully	Valid
4	Deleting drug data	Drug data	Data deleted successfully	Valid
5	Searching for drug	Drug name	Data found	Valid

Table 14 results of testing the payment transaction page

Nu.	Scenario	Input data	Expected results	Results
1	Display patient billing	Valid patient ID	Billing data appears	Valid
2	Payment according to billing	Payment amount = bill	Transaction is successfully saved	Valid
3	Payment greater than billing	Payment > bill	The system calculates the change	Valid
4	Payment less than billing	Payment < bill	The system displays a failure message	Valid
5	Save transaction	Valid data	Payment data is saved	Valid
6	Print proof of payment	Click print	Proof of payment is printed	Valid

Table 15 payment report page test results

Nu.	Scenario	Input data	Expected results	Results
1	Viewing reports	Specific period	The report appears according to the period	Valid
2	Printing reports	Click print	The report was printed successfully	Valid
3	Exporting reports	Click export	The report file was downloaded successfully	Valid

Table 16 recapitulation of test results

Module	Number of scenarios	Valid	Invalid
Login	4	4	0
Patient	5	5	0
Doctor	4	4	0
Polyclinic	3	3	0
Drug	5	5	0
Payment	6	6	0
Report	3	3	0
Total	30	30	0

System testing was conducted using the black-box testing method, which focuses on testing the main functions without considering the program code structure. Testing was conducted on the login module, patient data, doctor data, polyclinic data, medication data, payment transactions, and payment reports. Based on testing 30 scenarios, all system functions run as required. The test success rate reached 100%, indicating that the maternal and child hospital payment information system can manage data and process payments properly, accurately, and in accordance with user needs.

Discussion

The research results show that the developed maternal and child hospital payment information system can integrate various administrative and payment processes into a single web-based platform. This integration includes the management of patient, doctor, polyclinic, and medication data; medical records; payment transactions; and the preparation of payment reports. The integrated system makes it easier for users to access and manage data because all information is stored in a single, interconnected database (Abughazalah et al., 2024). This differs from manual processes, which generally lead to data redundancy, delayed recording, and difficulties retrieving information when needed (Rahmadhan & Handayani, 2023).

From a data management perspective, the developed system supports administrative processes more structurally than conventional methods. Using a relational database with tables for patients, doctors, clinics, medications, medical records, medication details, payments, and users, every transaction can be systematically recorded and integrated. Inter-entity relationships, defined through primary and foreign keys, enable direct linkage between medical service data and patient payment data. This results in more consistent, accurate information because the entire recording process is centralized in a single system (Ren, 2022).

In healthcare delivery, integrating patient data, medical records, and medication use supports smooth hospital operations. Every doctor's examination can be directly recorded in the system and used to calculate patient billing. This approach reduces the risk of data loss, recording errors, and discrepancies between departments, which often occur in systems without integration (Patel et al., 2024). Furthermore, information

about medications administered to patients can be automatically recorded through the medication details module, facilitating more effective stock management and tracking of medication usage.

From a financial administration perspective, the developed payment system simplifies billing calculations and transaction recording (Hidayah et al., 2025). The system displays billing information based on the medical services patients receive, calculates total payments, automatically determines change, and generates proof of payment that can be used as transaction documentation (Islayem et al., 2025). This process automation helps reduce calculation errors that commonly occur in manual recording (Perdana et al., 2023). Furthermore, payment status can be monitored in real time, making it easier for the administration department to track patient payments and reducing the potential for undocumented arrears (Yeen et al., 2023).

Test results from the black-box testing method indicate that all the system's main functions meet user requirements. Testing was conducted on seven main modules: login, patient data, doctor data, polyclinic data, medication data, payment transactions, and payment reports. Of the 30 test scenarios, all yielded valid results, achieving a 100% success rate. These results demonstrate that the system can receive input, process data, and produce output in accordance with the specified requirements. The success of this testing also indicates that the system has a high level of reliability for supporting payment administration operations in a maternal and children's hospital environment.

The findings of this study align with those of Marbella et al. (2024), who stated that implementing a web-based information system can improve the effectiveness of patient data management and accelerate the healthcare process. The data integration implemented in the developed system demonstrated similar benefits, namely facilitating information access and reducing administrative errors (Ferreira et al., 2024; Kuswari et al., 2024). The results of this study also support Sanjuluca's (2022) findings, which explain that Hospital Information Systems play a crucial role in supporting operational processes and decision-making. By automatically compiling payment reports, this system can generate information that serves as a basis for hospital management's evaluation and decision-making.

Furthermore, this study's results reinforce those of Laurenxius et al. (2025), who found that digitizing healthcare administration processes can improve service efficiency. In the developed system, payment recording and report preparation can be automated, reducing the time required to complete administration compared to manual methods (Ahmed et al., 2023; Huang et al., 2024). Reducing administrative processing time not only increases staff productivity but also can improve patient satisfaction by enabling faster, more organized service processes (Hussein et al., 2025; Persis et al., 2022).

This research also aligns with the findings of Kuswari et al. (2024); Rifial (2024), which emphasize the importance of integrating departments within a hospital information system. The novelty of this research lies in its focus on developing a payment system directly linked to medical service data and patient administration. This integration allows all service and payment information to be stored in a single system, making data management more efficient and transparent. Thus, this research not only produces a payment application but also provides an information management mechanism that supports the hospital's overall operational effectiveness. Overall, the research results indicate that developing a web-based payment information system for maternal and child hospitals can address various payment administration problems previously handled manually. The developed system successfully improves workflow efficiency, reduces the risk of transaction recording errors, accelerates the provision of

financial information, and supports transparency in patient payment management. Therefore, the implementation of this system has the potential to support hospitals' digital transformation while improving the quality of healthcare services for the public.

Conclusions

This research successfully designed and developed a web-based Payment Information System for Maternal and Child Hospitals that integrates the management of patient data, doctor data, polyclinic data, drug data, medical records, payment transactions, and payment reports. The implementation results show that the system can support administration and payment processes more effectively, quickly, and in a more structured manner than manual processes. Based on Black-Box Testing results for 30 test scenarios covering the login module, patients, doctors, polyclinics, drugs, payments, and reports, all system functions returned valid results with a 100% success rate. These findings indicate that the developed system has met users' functional needs and can operate in accordance with the research objectives.

The implications of this research indicate that implementing an integrated payment information system can improve operational efficiency, data management accuracy, and transparency in hospital financial administration. Theoretically, this research contributes to the development of health information systems studies, particularly on the integration of payment services with medical service data. Practically, the resulting system can serve as a reference for hospital managers in supporting the digital transformation of healthcare services. However, this research still has several limitations. The developed system still focuses on internal hospital payment management and has not been integrated with external systems such as BPJS services, insurance companies, or digital payment services. Furthermore, system evaluation is still limited to functional testing using black-box testing and does not include in-depth testing of performance, security, or user satisfaction.

Given these limitations, further research is recommended to develop the system by integrating BPJS services, health insurance, and various electronic payment methods to enhance payment service flexibility. Further research could also conduct more comprehensive testing, including security, performance, and usability evaluations using standardized instruments. Furthermore, developing an analytical dashboard-based reporting feature and utilizing decision-making support technology could be a direction for further research to improve the effectiveness of financial management and service quality at the maternal and child hospital.

References

- Abughazalah, M., Alsaggaf, W., Saifuddin, S., & Sarhan, S. (2024). Centralized vs. Decentralized Cloud Computing in Healthcare. *Applied Sciences*, 14(17), 7765. <https://doi.org/10.3390/app14177765>
- Ahmed, A. M., Mohammed, C. N., & Ahmad, A. M. (2023). Web-based payroll management system: design, implementation, and evaluation. *Journal of Electrical Systems and Information Technology*, 10(1), 17. <https://doi.org/10.1186/s43067-023-00082-5>
- Avinash, B., & Joseph, G. (2024). Reimagining healthcare supply chains: a systematic review on digital transformation with specific focus on efficiency, transparency and responsiveness. *Journal of Health Organization and Management*, 38(8), 1255–1279. <https://doi.org/10.1108/JHOM-03-2024-0076>
- Bhuiyan, M. R. I., Akter, M. S., & Islam, S. (2025). How does digital payment transform

- society as a cashless society? An empirical study in the developing economy. *Journal of Science and Technology Policy Management*, 16(4), 756–774. <https://doi.org/10.1108/JSTPM-10-2023-0170>
- Biswas, T. R., Hossain, M. Z., & Comite, U. (2024). Role of Management Information Systems in Enhancing Decision-Making in Large-Scale Organizations. *Pacific Journal of Business Innovation and Strategy*, 1(1), 5–18. <https://doi.org/10.70818/pjbis.2024.v01i01.03>
- Ferreira, J. C., Elvas, L. B., Correia, R., & Mascarenhas, M. (2024). Enhancing EHR Interoperability and Security through Distributed Ledger Technology: A Review. *Healthcare*, 12(19), 1967. <https://doi.org/10.3390/healthcare12191967>
- Hamdat, A. B., C., Samalam, A. G., Rizal, M., & Lawalata, I. L. D. (2024). The Impact of Management Information Systems on Decision-Making Efficiency. *Vifada Management and Digital Business*, 1(2), 56–74. <https://doi.org/10.70184/qpw1rq78>
- Hidayah, Z. A., Fauzi, A., & Mustofa, A. (2025). Digitalization of Madrasah Financial System in Managing Financial Transparency and Accountability. *Fikroh: Jurnal Pemikiran Dan Pendidikan Islam*, 18(1), 34–42. <https://doi.org/10.37812/fikroh.v18i1.1730>
- Huang, W.-L., Liao, S.-L., Huang, H.-L., Su, Y.-X., Jerng, J.-S., Lu, C.-Y., Ho, W.-S., & Xu, J.-R. (2024). A case study of lean digital transformation through robotic process automation in healthcare. *Scientific Reports*, 14(1), 14626. <https://doi.org/10.1038/s41598-024-65715-9>
- Hussein, A. H. M., Hashish, E. A. O. A., Elghaffar, B. A. A., & Elliotthey, N. S. H. (2025). Streamlining emergency nursing care post-pandemic: A lean approach for reducing wait times and improving patient and staff satisfaction in the hospital. *BMC Nursing*, 24(1), 445. <https://doi.org/10.1186/s12912-025-02759-w>
- Islayem, R., Gebreab, S., AlKhader, W., Musamih, A., Salah, K., Jayaraman, R., & Khan, M. K. (2025). Using large language models for enhanced fraud analysis and detection in blockchain based health insurance claims. *Scientific Reports*, 15(1), 29763. <https://doi.org/10.1038/s41598-025-15676-4>
- Iyanna, S., Kaur, P., Ractham, P., Talwar, S., & Najmul Islam, A. K. M. (2022). Digital transformation of healthcare sector. What is impeding adoption and continued usage of technology-driven innovations by end-users? *Journal of Business Research*, 153, 150–161. <https://doi.org/10.1016/j.jbusres.2022.08.007>
- Jani, K., & Chaudhary, B. (2023). Importance of Hospital Management. In *A Guide to Hospital Administration and Planning* (pp. 25–41). Springer Nature Singapore. https://doi.org/10.1007/978-981-19-6692-7_2
- Kuswari, M., Gantino, R., & Maratis, J. (2024). Maximizing Healthcare Service Information System: Understanding the Influence of Integration on Efficiency. *ADI Journal on Recent Innovation (AJRI)*, 6(2), 108–117. <https://doi.org/10.34306/ajri.v6i2.1145>
- Laurenxius, V. S., Ginting, C. N., & Ginting, R. (2025). Efficiency Of Transition From Manual Medical Records To Electronic Medical Records On The Speed Of Patient Service At RSU Royal Prima Medan. *Indonesian Journal of Electronics, Electromedical Engineering, and Medical Informatics*, 7(2), 245–252. <https://doi.org/10.35882/ijeeemi.v7i2.79>
- Marbella, H. N., Akbar, I. A., & Setiawan, B. (2024). Design and development of a web-based patient management information system. *Procedia Computer Science*, 234, 1799–1806. <https://doi.org/10.1016/j.procs.2024.03.188>
- Nkrumah, G. A., Antwi, M., Attachey, A. Y., Janssens, W., & Wit, T. F. R. de. (2022).

- Readiness of Ghanaian health facilities to deploy a health insurance claims management software (CLAIM-it). *PLOS ONE*, 17(10), e0275493. <https://doi.org/10.1371/journal.pone.0275493>
- Patel, D., Sahu, C. K., & Rai, R. (2024). Security in modern manufacturing systems: integrating blockchain in artificial intelligence-assisted manufacturing. *International Journal of Production Research*, 62(3), 1041–1071. <https://doi.org/10.1080/00207543.2023.2262050>
- Perdana, A., Lee, W. E., & Mui Kim, C. (2023). Prototyping and implementing Robotic Process Automation in accounting firms: Benefits, challenges and opportunities to audit automation. *International Journal of Accounting Information Systems*, 51, 100641. <https://doi.org/10.1016/j.accinf.2023.100641>
- Persis, D. J., S., A., Sunder M, V., G, R., Sreedharan, V. R., & Saikouk, T. (2022). Improving patient care at a multi-speciality hospital using lean six sigma. *Production Planning & Control*, 33(12), 1135–1154. <https://doi.org/10.1080/09537287.2020.1852623>
- Rahmadhan, M. A. W. P., & Handayani, P. W. (2023). Challenges of vaccination information system implementation: A systematic literature review. *Human Vaccines & Immunotherapeutics*, 19(2). <https://doi.org/10.1080/21645515.2023.2257054>
- Ren, S. (2022). Optimization of Enterprise Financial Management and Decision-Making Systems Based on Big Data. *Journal of Mathematics*, 2022(1). <https://doi.org/10.1155/2022/1708506>
- Rifial, M., Razak, A., Darmawansyah, D., Indar, I., & Rahman, A. (2024). Impact of Health System Usage, Patient Satisfaction, Information Quality, and Service Quality on Hospital Management Information System Utilization at Madani Regional General Hospital. *Journal of Angiotherapy*, 8(11), 1–8. <https://doi.org/10.25163/angiotherapy.81110061>
- Sanjuluca, T. H. P., de Almeida, A. A., & Cruz-Correia, R. (2022). Assessing the Use of Hospital Information Systems (HIS) to Support Decision-Making: A Cross-Sectional Study in Public Hospitals in the Huíla Health Region of Southern Angola. *Healthcare*, 10(7), 1267. <https://doi.org/10.3390/healthcare10071267>
- Shittu, R. A., Ehidiemen, A. J., Ojo, O. O., Zouo, S. J. C., Olamijuwon, J., Omowole, B. M., & Phillips, A. Q. O. (2024). The role of business intelligence tools in improving healthcare patient outcomes and operations. *World Journal of Advanced Research and Reviews*, 24(2), 1039–1060. <https://doi.org/10.30574/wjarr.2024.24.2.3414>
- Varnosfaderani, S. M., & Forouzanfar, M. (2024). The Role of AI in Hospitals and Clinics: Transforming Healthcare in the 21st Century. *Bioengineering*, 11(4), 337. <https://doi.org/10.3390/bioengineering11040337>
- Yeen, C. L. S., Basiruddin, R., Ali, Z. M., & Shah, D. R. S. I. (2023). Methods to Reduce Outstanding Medical Fees at Public Hospital in Malaysia: An Action Research Project. *Journal of Social Service Research*, 49(6), 731–753. <https://doi.org/10.1080/01488376.2023.2269214>