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Design of a Web-Based Clinical Management Information System at Sri Manik Farma Clinic

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Abstrak

Peningkatan pemanfaatan teknologi informasi di bidang kesehatan menuntut adanya sistem yang terintegrasi untuk mengelola proses klinis dan administratif, khususnya pada klinik berskala kecil dan menengah. Banyak klinik masih menerapkan pengelolaan informasi secara manual atau terpisah, yang menyebabkan duplikasi data, keterbatasan visibilitas operasional, serta alur kerja yang kurang efisien. Penelitian ini dilatarbelakangi oleh kebutuhan akan perancangan sistem yang terstruktur dan terintegrasi untuk mendukung aktivitas manajemen klinik. Penelitian ini mengusulkan perancangan sistem informasi manajemen klinik berbasis web pada Klinik Sri Manik Farma yang mengintegrasikan pengelolaan data pasien, data dokter, layanan klinis, persediaan obat, kunjungan medis, dan proses penagihan dalam satu platform terpadu. Sistem dirancang menggunakan pendekatan basis data terpusat dengan alur kerja berbasis administrator untuk menjaga konsistensi data dan kemudahan pengelolaan. Kontribusi penelitian ini terletak pada penyediaan rancangan sistem yang merepresentasikan alur kerja klinis secara menyeluruh serta menghubungkan proses klinis dengan aktivitas administratif dan keuangan. Evaluasi sistem dilakukan melalui validasi fungsional dan analisis kegunaan yang menitikberatkan pada ketepatan operasi CRUD, integrasi alur kerja, dan kejelasan interaksi pengguna. Hasil penelitian menunjukkan bahwa rancangan sistem yang diusulkan mampu mendukung pengelolaan data secara terstruktur, mengurangi redundansi data, dan meningkatkan transparansi operasional. Pengembangan selanjutnya disarankan untuk menambahkan akses multi-peran, peningkatan mekanisme keamanan, serta fitur analitik lanjutan guna mendukung pengambilan keputusan manajerial.

Kata kunci*— Sistem Informasi Manajemen Klinik, Sistem Berbasis Web, Sistem Informasi Kesehatan, Manajemen Klinik, Integrasi Sistem*

Abstract

The increasing reliance on information technology in healthcare has emphasized the need for integrated systems to manage clinical and administrative processes, particularly in small and medium-sized clinics. Many clinics still rely on manual or fragmented information handling, which leads to data redundancy, limited operational visibility, and inefficient workflows. This research is motivated by the need to design a structured and integrated solution to support clinic management activities. The study proposes the design of a web-based clinical management information system for Sri Manik Farma Clinic that integrates patient management, doctor management, clinical services, medicine inventory, medical visits, and billing within a single platform. The system is designed using a centralized database approach and an administrator-centered workflow to ensure data consistency and ease of management. The contribution of this research lies in providing a comprehensive system design that represents end-to-end clinical workflows and aligns clinical operations with administrative and financial processes. System evaluation is conducted through functional validation and usability analysis, focusing on the correctness of CRUD operations, workflow integration, and user

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interaction clarity. The results indicate that the proposed design effectively supports structured data management, reduces redundant data handling, and improves operational transparency. Future work is recommended to extend the design by incorporating multi-role access control, enhanced security mechanisms, and advanced analytical features to support decision making. Overall, the proposed system design provides a relevant foundation for improving clinical management in small healthcare facilities.

Keywords— *Clinical Management Information System, Web-Based System Design, Healthcare Information System, Clinic Management, System Integration*

1. INTRODUCTION

The rapid digital transformation in the healthcare sector has significantly reshaped how clinical services are delivered, managed, and evaluated. Healthcare institutions are increasingly required to handle large volumes of patient data, clinical records, and administrative information while maintaining high standards of accuracy, security, and efficiency. Clinical management information systems have emerged as critical technological infrastructures to support these demands by integrating clinical workflows, patient data management, and administrative processes into unified digital platforms. Recent studies emphasize that well designed clinical information systems improve service quality, reduce operational inefficiencies, and enhance decision making capabilities for healthcare providers [1]. In outpatient clinics and primary healthcare facilities, the role of information systems becomes even more crucial due to limited resources and high patient throughput. Small and medium sized clinics must balance clinical accuracy, service speed, and regulatory compliance, all of which depend heavily on reliable and timely information management. Consequently, the adoption of clinical management information systems is no longer optional but a strategic necessity to ensure sustainable healthcare service delivery.

Despite the recognized importance of information systems in healthcare, many clinics still rely on fragmented or partially digitalized management practices. In numerous primary healthcare settings, patient registration, medical records, pharmacy management, and billing processes are handled using separate applications or manual documentation. Such fragmented systems often lead to data redundancy, inconsistencies, delayed reporting, and increased risk of human error [2]. Empirical research indicates that the absence of integrated clinical management systems negatively affects service efficiency and patient satisfaction, particularly in clinics with growing patient volumes [3]. Furthermore, healthcare professionals frequently face difficulties in accessing comprehensive patient information, which may compromise clinical decision accuracy and continuity of care. These challenges are compounded by increasing regulatory requirements related to medical data documentation, privacy protection, and reporting standards. The general problem addressed in this research lies in the lack of an integrated clinical management information system that supports coordinated clinical, administrative, and managerial functions within small scale healthcare facilities such as Sri Manik Farma Clinic.

In response to these challenges, this study aims to design and implement a clinical management information system tailored to the operational needs of Sri Manik Farma Clinic. The primary research goal is to develop an integrated system that supports patient registration, medical record management, clinical services documentation, pharmacy transactions, and billing processes within a single digital framework. The motivation for this research is driven by the growing demand for efficient healthcare services and the need to enhance managerial oversight in small and medium sized clinics. Previous studies demonstrate that integrated clinical information systems contribute to improved data accuracy, reduced processing time, and

enhanced coordination between clinical and administrative units [4]. By consolidating clinical and operational data, healthcare managers can obtain real time insights into service performance, resource utilization, and patient flow. The proposed system is designed to address these needs by ensuring data consistency, improving information accessibility, and supporting evidence based decision making at both clinical and managerial levels.

The proposed solution in this research involves the design of a clinical management information system that integrates core clinical workflows with administrative and reporting functions. The system architecture is structured to support end to end clinical processes, starting from patient registration and consultation to prescription handling and billing. This research contributes both practically and academically. From a practical perspective, the system provides a comprehensive digital solution that enhances operational efficiency and service quality at Sri Manik Farma Clinic. From an academic perspective, the study contributes to the growing body of knowledge on clinical information system design for small scale healthcare providers by presenting an implementation focused framework. The evaluation of the proposed system is conducted through functional testing and user based assessment, focusing on system usability, data accuracy, and service efficiency improvements [5]. In conclusion, this research demonstrates that implementing an integrated clinical management information system can significantly improve healthcare service delivery and managerial effectiveness in small and medium sized clinics. The findings support the adoption of tailored information system solutions as a viable approach to strengthening healthcare operations and decision making in primary healthcare environments.

2. METHODS

Recent studies have examined the implementation of clinical management and health information systems in primary healthcare environments, focusing on integration, usability, and service outcomes. Kruse et al. reported that poor electronic health record usability and fragmented workflows reduce efficiency and user acceptance in outpatient settings [2]. Hasanain et al. evaluated clinical information system deployment in outpatient clinics and demonstrated improvements in reporting accuracy and coordination, although their evaluation relied mainly on perception based questionnaires rather than operational metrics [5]. Alsharo et al. showed that integrated health information systems in primary care improve data consistency and perceived care quality, but their scope excluded pharmacy and billing integration [4]. Other research has concentrated on adoption factors and implementation strategies. Nguyen et al. identified system flexibility, training, and organizational readiness as dominant factors influencing clinical information system adoption in primary healthcare, yet their analysis was limited to survey data without transactional validation [6]. Cresswell et al. emphasized governance, workflow alignment, and iterative implementation as critical success factors, noting that misalignment often leads to partial system utilization [7]. Overall, prior studies confirm benefits of clinical information systems, yet give limited attention to integrated designs combining clinical services, pharmacy management, and billing in small clinics.

2.1 Research Object and Data Source

The object of this research is Sri Manik Farma Clinic, a primary healthcare facility that performs routine clinical and administrative activities, including patient registration, medical examinations, pharmacy services, and billing transactions. The data used in this study consist of historical clinical and administrative records, such as patient identity data, medical records, prescription information, visit records, and transaction reports. These data are obtained directly from the clinic through document analysis and interviews with clinic staff and management, representing actual operational conditions that form the basis for system design. The utilization

and processing of these data within the proposed system are illustrated by the system flowchart shown in Figure 1. The flowchart describes an administrator-centered workflow that begins with system authentication, followed by access to the main dashboard and data management modules, including patient data, doctor data, clinical services, medicine inventory, medical visits, and billing. All data processing activities are performed through Create, Read, Update, and Delete operations and stored in a centralized database. This flowchart demonstrates how real clinical and administrative data from the research object are transformed into structured information to support the design of the web-based clinical management information system.

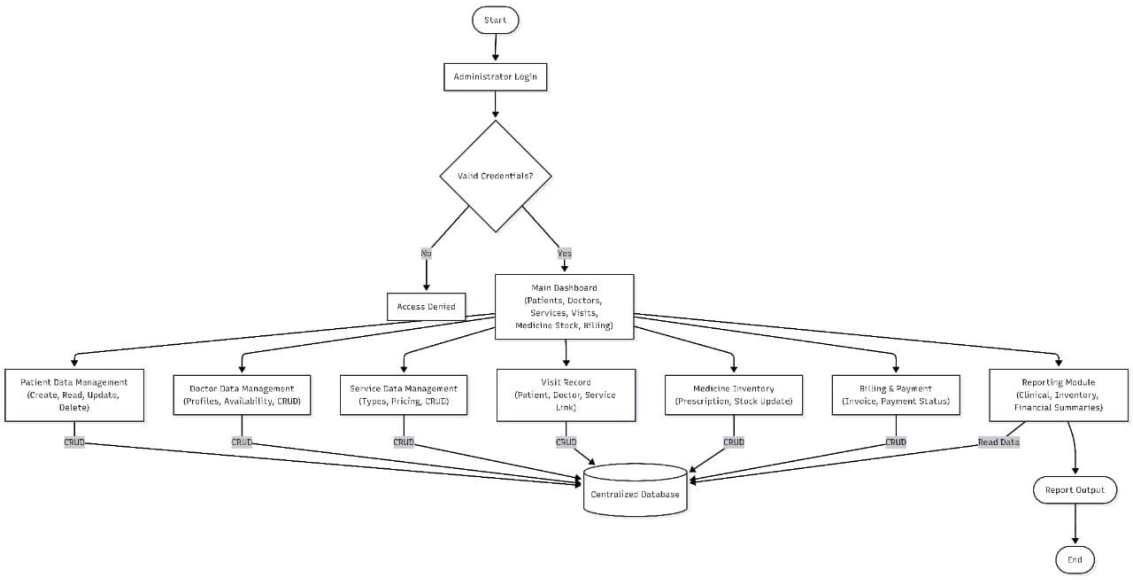

Figure 1. Flowchart of the web-based clinical management information system illustrating role-based user workflows and database interaction

2.2 Data Preparation and Requirement Analysis

Data preparation is conducted to ensure that the collected information accurately reflects real clinical workflows. At this stage, existing documents and records are analyzed to identify data entities, data relationships, and information flow between clinical and administrative processes. Requirement analysis focuses on defining functional requirements, such as patient management, medical record documentation, pharmacy management, billing processing, and report generation. Non functional requirements related to usability, data security, and accessibility are also identified. This structured requirement analysis is essential to align system design with healthcare workflows and organizational needs, as recommended in health information system development studies [8].

2.3 Proposed Method and System Design Approach

This design approach follows best practices in clinical information system development, which highlight the importance of workflow alignment and system integration [7]. This research adopts a system design oriented methodology to develop a web based clinical management information system. The design approach includes conceptual system modeling, architectural design, database schema design, and user interface design. System functionalities and interactions are described using conceptual diagrams to represent the relationships between users, processes, and data. The proposed system integrates clinical and administrative modules within a centralized web based platform to ensure data consistency and accessibility. This design approach emphasizes workflow alignment and modularity, which are recognized as key principles in clinical information system design [7].

2.4 Supporting Techniques for System Quality Improvement

Several supporting techniques are incorporated to improve system quality and reliability. Data validation mechanisms are designed to reduce input errors during patient registration and transaction recording. Role based access control is applied to restrict system access according to user responsibilities, thereby enhancing data confidentiality and security. In addition, a modular system structure is adopted to improve system scalability and maintainability. These techniques are consistent with best practices in health information system governance and usability improvement [9].

2.5 System Evaluation and Validation

System evaluation is conducted through functional validation and user based assessment. Functional validation ensures that each system module operates according to defined requirements and supports complete CRUD operations. User based assessment involves feedback from clinic staff to evaluate system usability, clarity of information presentation, and compatibility with daily clinical workflows. The evaluation focuses on validating system design effectiveness rather than measuring performance efficiency. This evaluation strategy is commonly applied in clinical information system design research to assess design feasibility and practical applicability [10].

3. RESULTS AND DISCUSSION

3.1 System Design Results

The results of this research demonstrate the effectiveness of the proposed design of a web-based clinical management information system in integrating clinical and administrative workflows at Sri Manik Farma Clinic. The system design consists of interconnected modules including user authentication, dashboard monitoring, patient management, doctor management, clinical services, medicine inventory, medical visits, and billing, as illustrated in Figure 2 through Figure 9. Functional validation shows that all modules support Create, Read, Update, and Delete operations consistently through a centralized database, ensuring data integrity and traceability across system processes. Usability and workflow analysis indicate that the administrator-centered interface simplifies system interaction by providing a structured and sequential workflow, reducing redundant data entry and improving clarity in task execution. The card-based dashboard design enhances information visibility and supports efficient operational monitoring. From a workflow perspective, patient, visit, prescription, and billing data are processed in an integrated manner, which improves data consistency between clinical and financial records. These results confirm that the proposed system design effectively addresses common challenges faced by small clinics, such as fragmented data management and limited operational visibility. Overall, the findings suggest that the designed system provides a coherent, usable, and integrated framework that can serve as a solid foundation for future system implementation and further evaluation.

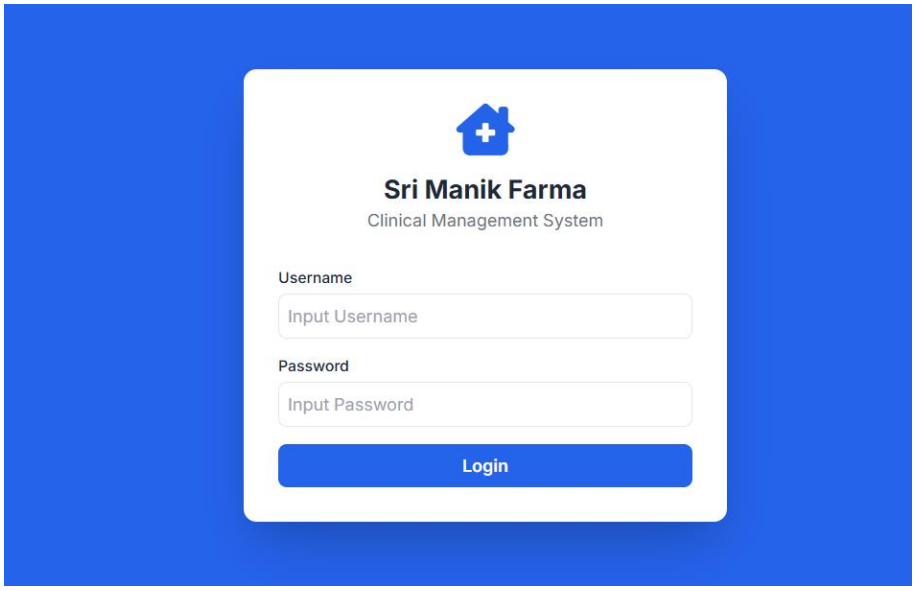

Figure 2. User Authentication Interface

This figure illustrates the user authentication interface that functions as the initial access control mechanism of the clinical management information system. Through this interface, the administrator is required to enter valid credentials before accessing system functionalities. The authentication process ensures data security and prevents unauthorized access to sensitive clinical and administrative information, which is essential in healthcare information systems.

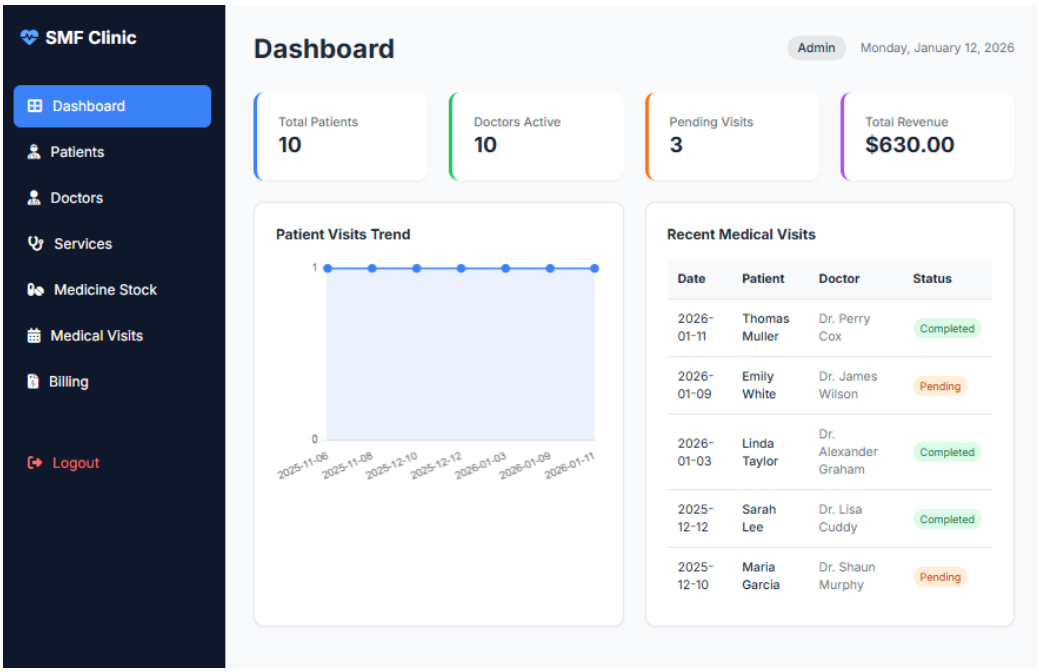

Figure 3. System Dashboard Overview

This figure presents the main dashboard of the system, which serves as a centralized control panel for monitoring clinic operations. The dashboard displays summarized information related to patients, doctors, medical visits, and financial data. By providing real-time operational indicators in a card-based layout, the dashboard supports efficient administrative oversight and

quick assessment of clinic activities. It also visualizes patient visit trends and recent medical visits, enabling administrators to monitor clinic operations and service performance efficiently.

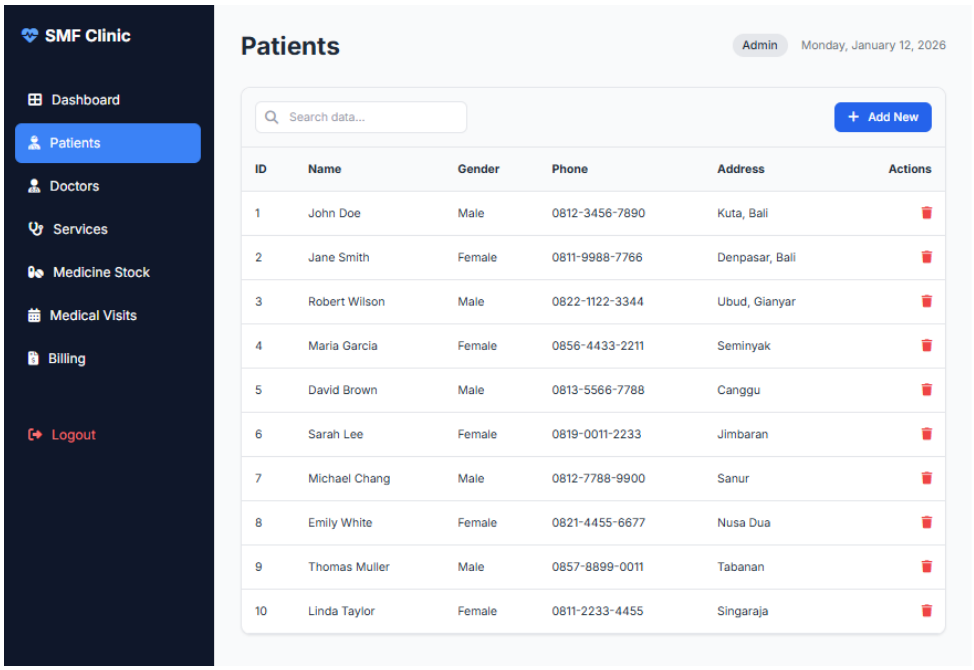

Figure 4. Patient Data Management Module

This figure shows the patient data management module used to store and manage patient demographic information. The module supports Create, Read, Update, and Delete operations, allowing the administrator to maintain accurate and up-to-date patient records. Patient data stored in this module become the primary reference for medical visit records, prescription processing, and billing activities.

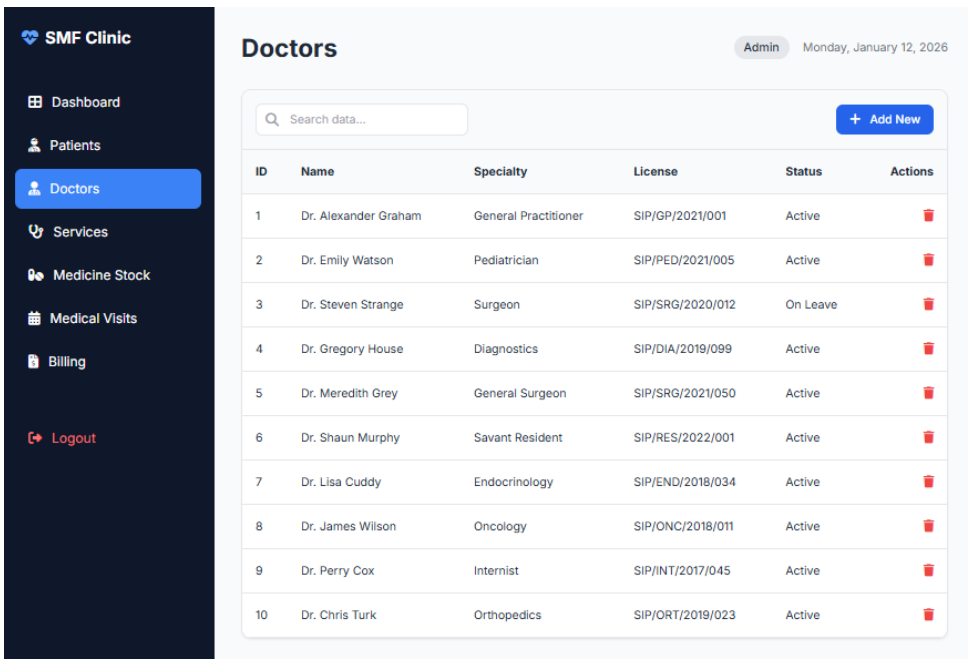

Figure 5. Doctor Management Module

This figure illustrates the doctor management module, which is responsible for maintaining information related to physicians, including specialties, license details, and availability status. The module supports structured management of doctor profiles and ensures that accurate doctor information is available when assigning physicians to medical visits. The module supports CRUD operations for doctor profiles, including specialties, license numbers, and availability status, enabling effective scheduling and clinical resource management.

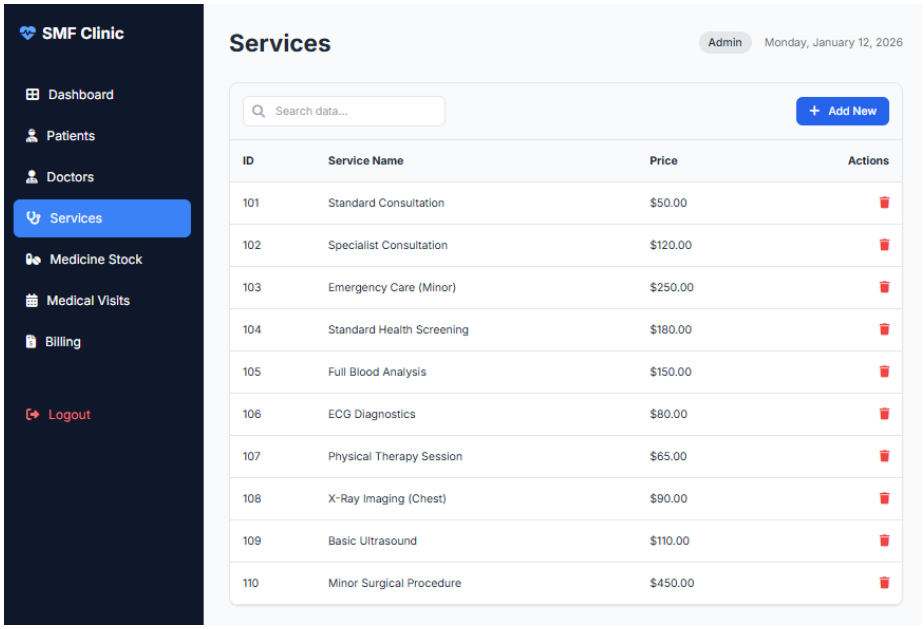

Figure 6. Clinical Services Management Module

This figure depicts the clinical services management module, which defines the types of healthcare services offered by the clinic along with their corresponding prices. This module ensures service standardization and consistency, as service data are reused during medical visit documentation and billing calculations.

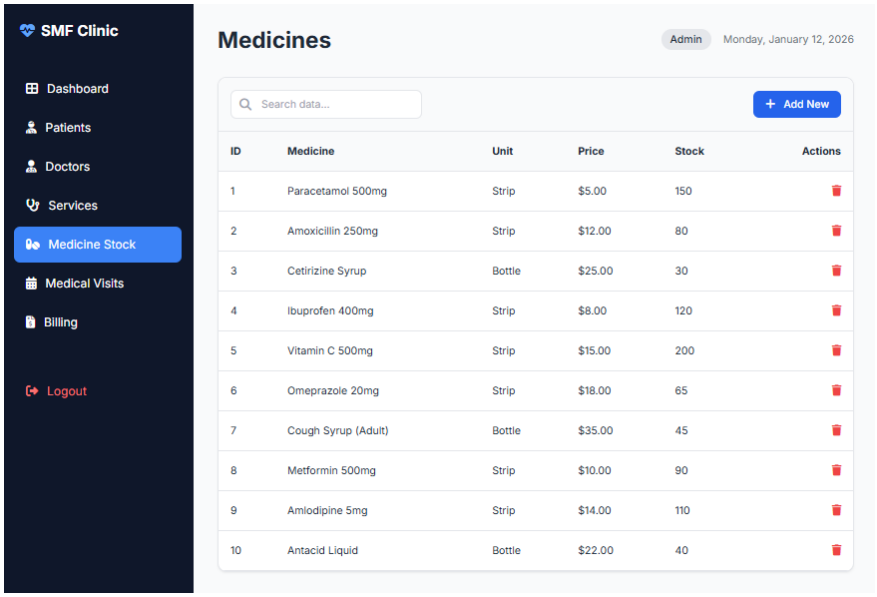

Figure 7. Medicine Stock Management Module

This figure presents the medicine inventory management module designed to manage drug information, unit types, pricing, and stock levels. The module supports inventory monitoring and stock updates, which are essential for ensuring medicine availability and supporting prescription fulfillment during clinical operations.

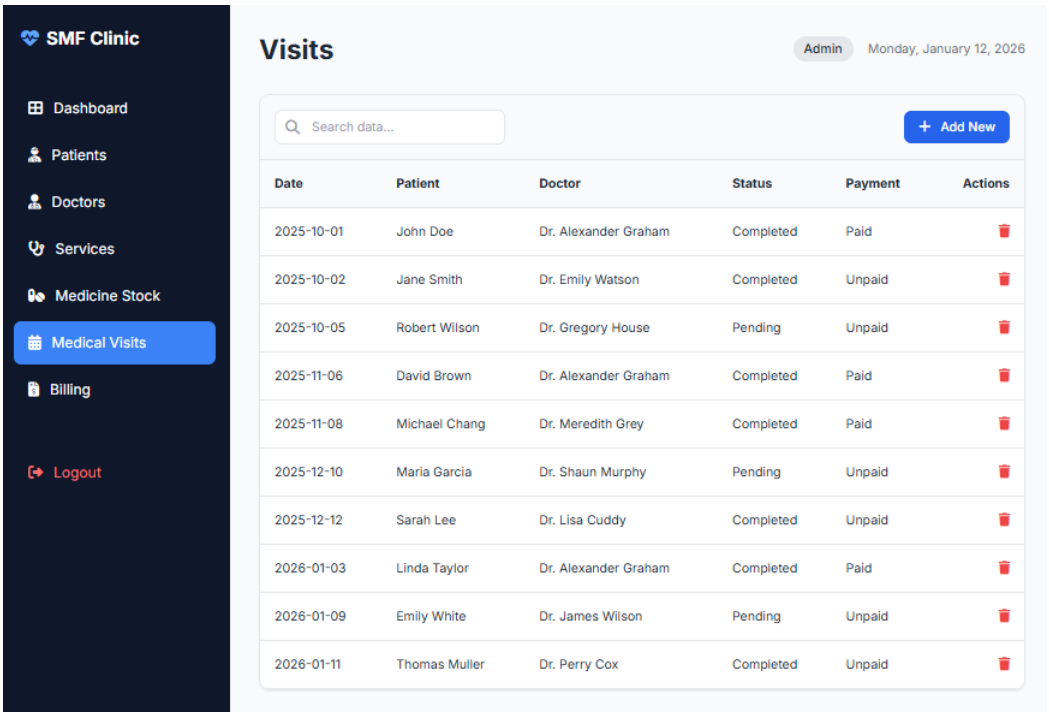

Figure 8. Medical Visit Management Module

This figure shows the medical visit management module that integrates patient data, assigned doctors, visit dates, visit status, and payment status. This module represents the core clinical workflow of the system, linking clinical services, prescriptions, and billing data within a single visit record.

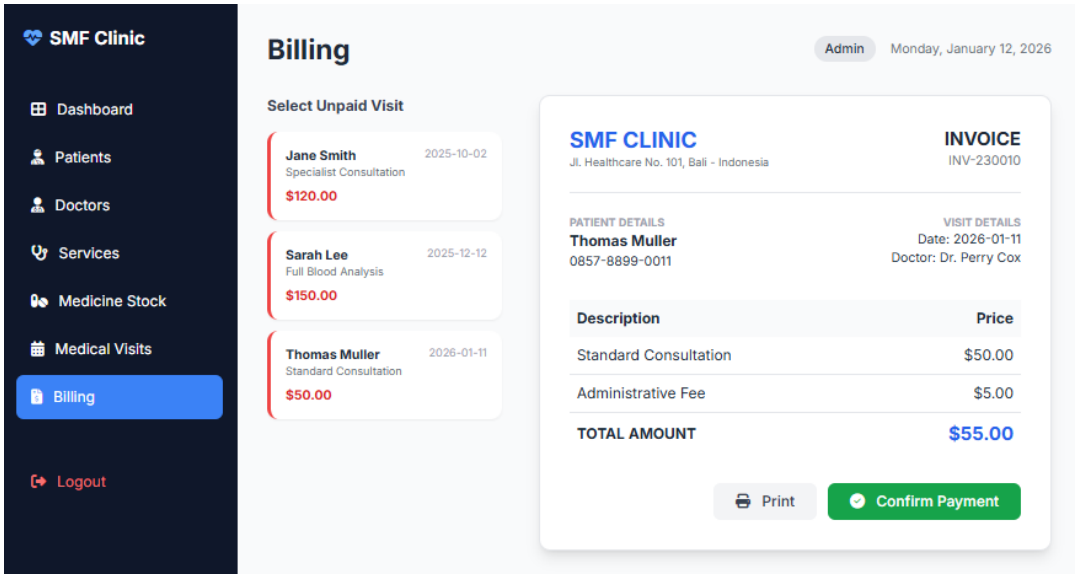

Figure 9. Billing and Payment Processing Module

This figure illustrates the billing module of the system, which manages unpaid visits, invoice generation, and payment confirmation. The interface allows staff to review service details, calculate total charges automatically, and record payment transactions, supporting accurate and efficient financial processing within the clinic.

3.2 Functional Testing Results

Functional testing is conducted to validate whether each system module operates according to the defined design specifications. The testing focuses on verifying Create, Read, Update, and Delete operations across all modules. Patient data entry, modification, retrieval, and deletion functions operate correctly and consistently update the centralized data storage. Doctor information management and service data management also function as expected, ensuring that updates are reflected accurately across related modules. Testing of the medicine inventory module confirms that stock quantities are updated automatically following prescription processing. Medical visit records are correctly linked to patient and doctor data, and visit status changes are reflected consistently throughout the system. The billing module successfully generates invoices based on selected services and records payment confirmations without data inconsistencies. These results indicate that the designed system fulfills its functional requirements and supports integrated clinical and administrative operations.

3.3 Usability and Workflow Analysis

Usability and workflow analysis focuses on evaluating how effectively the designed system supports administrative and clinical management tasks through a single administrator role. The card-based dashboard design enables the administrator to access key system modules and operational summaries without navigating complex menu structures. This interface structure improves clarity and reduces cognitive load when performing routine data management activities. From a workflow perspective, the system design supports a sequential and integrated process flow, as illustrated in the system flowchart. Patient data entered in the patient management module are reused across medical visit records, medicine inventory processing, and billing activities. This integration minimizes redundant data entry and ensures consistency between clinical and administrative records. The centralized database design further supports smooth data transitions between modules and reduces the risk of data inconsistency. Qualitative usability observations indicate that the administrator can complete core tasks such as patient data management, visit recording, and billing processing in a structured and predictable manner. The unified workflow design reduces manual coordination between separate systems and improves task efficiency. Overall, the usability and workflow analysis demonstrates that the proposed system design provides a coherent and manageable workflow suitable for small clinics, supporting effective clinical and administrative operations through a simplified and integrated interface.

3.4 Discussion of Results

The results demonstrate that the proposed system design addresses key challenges commonly faced by small and medium-sized clinics, such as fragmented data management, manual record handling, and limited operational visibility. By integrating patient management, clinical services, pharmacy operations, and billing into a web-based system, the design improves workflow coordination and information accessibility. Compared to conventional manual or partially computerized systems, the proposed design provides a clearer separation of responsibilities through role-based access and improves data organization through centralized storage. The discussion confirms that the system design aligns with best practices in clinical management information systems by emphasizing modularity, usability, and workflow integration. Overall, the results indicate that the proposed system design provides a feasible and structured foundation for improving clinical and administrative management at Sri Manik

Farma Clinic and can serve as a basis for future system implementation and performance evaluation.

4. CONCLUSIONS

This research has presented the design of a web-based clinical management information system intended to support integrated clinical and administrative operations at Sri Manik Farma Clinic. The proposed system design consolidates patient management, doctor management, clinical services, medicine inventory, medical visits, and billing processes within a single platform managed through an administrator-centered interface. The results demonstrate that the designed system is able to represent end-to-end clinical workflows in a structured and coherent manner, reduce data redundancy through centralized storage, and improve information organization for operational and managerial purposes. The main advantage of the proposed design lies in its simplicity and integration, which enables efficient data handling and clear workflow coordination, particularly suitable for small and medium-sized clinics. However, the system design is currently limited to a single user role and has not yet been evaluated through large-scale implementation or performance benchmarking. Future work is recommended to extend the system design by introducing role-based multi-user access, enhancing data security mechanisms, and integrating advanced analytical features such as service utilization statistics and decision support functions. Further evaluation through real-world deployment and quantitative performance analysis would also strengthen the validity and applicability of the proposed system design.

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