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**FACULTY OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF COMPUTER ENGINEERING**

**DESIGN AND IMPLEMENTATION OF A HOSPITAL MANAGEMENT INFORMATION SYSTEM**

*A dissertation submitted to the Department of Computer Engineering, Faculty of Engineering and Technology, University of Buea, in Partial Fulfilment of the Requirements for the Award of Bachelor of Engineering (B.Eng.) Degree in Computer Engineering.*

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**2023/2024 Academic Year**

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**Department of Computer Engineering   
Faculty of Engineering and Technology  
University of Buea**

**Certificate of Originality**

We the undersigned, hereby certify that this dissertion entitled **“DESIGN AND IMPLIMENTATION OF A HOSPITAL MANAGEMENT INFORMATION SYSTEM”** presented by ACHALE EBOT OMA, **Matriculation number FE20A002** has been carried out by him in the Department of Computer Engineering, Faculty of Engineering and Technology, University of Buea under the supervision of **PROF ELIE FUTE** and **DR. KENGNOU NICOLE.**

This dissertion is authentic and represents the fruits of his own research and efforts.

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**Dedication**

**Acknowledgment**

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**CHAPTER 1. GENERAL INTRODUCTION**

1. **Background and Context of Study**

Traditional paper-based systems in hospitals pose a significant challenge to effective patient care. Retrieving information is a time-consuming task, often requiring manual searching through physical folders. This delays treatment initiation and hinders real-time decision-making. Additionally, paper records are prone to errors like illegibility, misplacement, and loss, leading to inconsistencies in patient data and potentially compromising care quality. Incomplete medical histories can result in medication errors and misdiagnoses. Staff productivity also suffers due to the burden of managing cumbersome paperwork. These limitations translate to longer wait times for patients, potential harm due to inaccurate information, and difficulty in analyzing trends for improvement.

A Hospital Management Information System (HMIS) offers a powerful solution. It creates a centralized electronic database, granting real-time access to patient data and resource availability. This eliminates delays in retrieving information, facilitating efficient care coordination. Data validation features ensure accuracy and consistency, minimizing human error. Additionally, an HMIS streamlines record management by enabling easy access to complete medical histories regardless of physical records. This not only improves continuity of care but also frees up staff time for direct patient interaction. By collecting and analyzing data points, an HMIS empowers hospital administrators with valuable insights for informed decision-making, ultimately leading to improved patient care delivery, enhanced efficiency, and better resource management.

1. **Problem statement**

Hospital staff find it hard to manage the information in the hospital due to the traditional hand-written information used. This makes it difficult for them to know resources which are available for a patient at a given time. These resources could be the staff which include doctors and nurses, or the rooms available for the patient. When a patient needs medical attention, it will be difficult to know the rooms available for the patient, as well as available nurses and doctors who need to provide patient care. Also, this hand-written system makes it hard to reclaim, manage or process patients’ records when needed. This makes it difficult for the hospital staff to fully understand the patient’s problems in a case where the patient forgets his or her hospital book at home while coming either to do a consultation or do some lab tests.

1. **Objective of the Study**
   1. **General Objectives**

Build a digitalized and secure system which manages the information of hospitals in a user friendly way so that it can be easily retrieved by the staff when needed.

* 1. **Specific Objectives**
* Analyze other existing hospital management information systems which correspond to the problem mentioned. Know how the systems operate, their drawbacks and brainstorm solutions to these drawbacks
* Design a system which has similar functionalities to the existing systems which are very important to the staff and integrate the solution to their drawbacks as well.
* Implement the designed system to be user friendly in a way that staff can easily add or retrieve data from it.

1. **Proposed Methodology**

This project proposes a systematic approach to develop and implement a Hospital Management Information System (HMIS) that addresses the challenges outlined in the problem statement. The methodology will involve the following key phases:

* 1. **Requirements Gathering and Analysis:**
     1. **User Interviews and Surveys:**

Conduct interviews with key stakeholders, including doctors, nurses, administrative staff, and hospital management, to understand their specific needs and pain points regarding information management. Surveys can further gather broader perspectives on user requirements.

* + 1. **System Analysis:**

Analyze the existing paper-based system to identify its strengths and weaknesses. This involves understanding data flow, current processes, and limitations.

* + 1. **Defining Functional and Non-Functional Requirements:**

Based on the gathered information, document both functional requirements (what the system should do) and non-functional requirements (how the system should perform). This will include features like patient registration, appointment scheduling, medical record management, resource allocation, reporting, and security requirements like user access control and data privacy.

* 1. **System Design and Development:**
     1. **Technology Selection:**

Choose the appropriate technology stack for developing the HMIS. This includes selecting a database management system, programming language(s), and development frameworks based on factors like scalability, security, and integration capabilities.

* + 1. **System Architecture:**

Design the overall architecture of the HMIS, outlining the components, data flow, and communication between different modules. This includes functionalities like user interface design, data access layer, and business logic layer.

* + 1. **System Development:**

Develop the HMIS functionalities based on the designed architecture and system requirements. This involves coding, unit testing, integration testing, and user interface development.

* 1. **System Implementation and Testing:**
     1. **Data Migration:**

Migrate existing patient data from paper records to the electronic HMIS while ensuring data integrity and security. This may involve manual data entry or data conversion tools.

* + 1. **System Testing:**

Conduct comprehensive system testing to ensure the HMIS functions as intended. This includes unit testing, integration testing, user acceptance testing (UAT) involving hospital staff, and security testing to identify and address any vulnerabilities.

* + 1. **Training and User Support:**

Provide comprehensive training to hospital staff on using the HMIS effectively. This may involve user manuals, video tutorials, and hands-on training sessions. Ongoing support will be provided to address user queries and troubleshoot any issues that arise.

* 1. **Evaluation and Deployment:**
     1. **Evaluation:**

Evaluate the effectiveness of the implemented HMIS by collecting feedback from users and monitoring key performance indicators (KPIs) like improved access to information, reduced wait times, and enhanced data accuracy. This will help identify areas for further improvement.

* + 1. **Deployment:**

Once evaluation confirms the system's effectiveness and user satisfaction, the HMIS will be deployed for full-scale use within the hospital.

* + 1. **Maintenance and Support:**

Ongoing maintenance will be provided to ensure the HMIS remains functional and secure. This includes addressing user concerns, bug fixes, system updates, and incorporating any future enhancements identified during evaluation.

1. **Research Questions**

* Are there existing systems which manage hospital information? If there are systems, what are their loop-holes?
* What are the features of these systems?
* How can the new system be made to take in data and send it out in an appealing way which is easy to understand.

1. **Research Hypothesis**
2. **Significance of the Study**

Many healthcare facilities still rely on paper-based systems for managing patient records and hospital operations. While these traditional methods may seem familiar, this study emphasizes the critical need for a transition to a Hospital Management Information System (HMIS). Paper-based systems create significant roadblocks to efficient and high-quality patient care.

One major challenge lies in the retrieval of information. Locating specific details within a physical folder can be a time-consuming task, leading to delays in treatment initiation and hindering real-time medical decision-making. This inefficiency can have a ripple effect, impacting patient care and overall workflow. Additionally, paper records are susceptible to errors. Illegible handwriting, misplacement, and even loss of documents can compromise data accuracy and consistency. Incomplete medical histories due to missing or inaccurate information can then lead to medication errors and misdiagnoses, potentially jeopardizing patient safety.

Furthermore, managing paper records creates a significant burden on staff. Sorting through physical folders and maintaining extensive filing systems consumes valuable time that could be better spent on direct patient interaction. This burden ultimately affects both staff productivity and the quality of patient care.

An HMIS offers a powerful solution to these challenges. By creating a centralized electronic database, it grants immediate access to patient data and resource availability. This eliminates the time-consuming searches associated with paper records, facilitating efficient care coordination and improving overall workflow. Data validation features within the HMIS ensure accuracy and consistency, minimizing human error and protecting patient safety.

The benefits extend beyond immediate access. An HMIS streamlines record management by providing easy access to complete medical histories regardless of location. This fosters improved continuity of care, ensuring healthcare providers have a comprehensive understanding of a patient's medical background when making treatment decisions. Additionally, by eliminating the need for physical record management, an HMIS frees up valuable staff time. This allows healthcare professionals to focus on direct patient interaction, improving the overall patient experience.

Finally, an HMIS empowers hospital administrators with a powerful tool for data-driven decision making. By collecting and analyzing data points, the system provides valuable insights into hospital operations, patient trends, and resource utilization. This information allows administrators to make informed decisions that can improve patient care delivery, enhance operational efficiency, and optimize resource management.

In conclusion, this study underscores the significant advantages of adopting an HMIS. By addressing the shortcomings of paper-based systems and leveraging the power of digital solutions, healthcare facilities can create a more efficient, accurate, and patient-centered environment. This shift towards digital record management holds tremendous potential for improving the quality of care, enhancing staff productivity, and ultimately, optimizing overall healthcare delivery.

1. **Scope of the Study**

The significance of implementing a Hospital Management Information System (HMIS) within healthcare institutions cannot be overstated, particularly in addressing the inefficiencies and challenges posed by traditional paper-based systems. The transition from paper records to an electronic HMIS represents a pivotal advancement that promises transformative benefits across multiple facets of hospital operations and patient care.

One of the primary drawbacks of paper-based systems is the time-intensive process involved in retrieving patient information. Manual searching through physical folders not only delays treatment initiation but also impedes real-time decision-making by healthcare providers. This inefficiency can result in prolonged wait times for patients and potentially compromises their care due to delayed access to critical information. Furthermore, the inherent risks of paper records—such as illegibility, misplacement, and loss—contribute to inaccuracies and inconsistencies in patient data, which can lead to medication errors and misdiagnoses, thereby jeopardizing patient safety.

In contrast, an HMIS offers a streamlined solution by centralizing patient information into an electronic database. This centralized repository enables healthcare providers to access real-time patient data promptly, enhancing care coordination and facilitating quicker decision-making processes. By ensuring data accuracy and consistency through robust validation mechanisms, an HMIS mitigates the risks associated with human error inherent in paper-based systems. Moreover, the system's ability to provide comprehensive medical histories at the click of a button supports continuity of care, thereby reducing the likelihood of errors and improving overall care quality.

Beyond improving patient care, an HMIS also yields substantial operational benefits. By automating record management and reducing the administrative burden associated with paper records, healthcare staff can redirect their focus towards direct patient interaction and clinical activities. This not only enhances staff productivity but also contributes to a more efficient workflow within the hospital environment. Furthermore, the data aggregation and analytics capabilities of an HMIS empower hospital administrators with actionable insights into trends and performance metrics. These insights facilitate informed decision-making, optimize resource allocation, and support strategic planning initiatives aimed at enhancing hospital efficiency and quality of care delivery.

In conclusion, the implementation of an HMIS represents a paradigm shift in healthcare management, offering comprehensive solutions to the limitations of traditional paper-based systems. By improving access to information, enhancing data accuracy, and streamlining operations, HMIS not only drives efficiency gains but also significantly enhances patient safety and care quality. As healthcare continues to evolve, embracing technology such as HMIS will be crucial in meeting the demands for effective, integrated, and patient-centered care delivery.

1. **Delimitation of the Study**
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