The Risk of Data Loss in Computerized Medical Record Systems

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Abstract — **Background: Medical labs play an important role in healthcare by delivering critical diagnostic services. Previously dependent on article records, many hospitals have switched to electronic systems, increasing efficiency and security in patient data management. Implementing electronic systems in healthcare has had a distinct effect on medical laboratories, which play a crucial role in diagnostic procedures and patient data management. This article explicitly examines the distinctions between digitalisation in laboratories and other healthcare sectors, such as clinics and hospitals, concerning document flow and data processing problems.**

Objective: This study aims to evaluate the deployment and effectiveness of electronic health records and laboratory information management systems in medical laboratories. The objective is to emphasise the technological elements and operational difficulties, explicitly focusing on the dangers and preventive measures related to data management without extensively discussing the direct consequences on patient care and hospital operations.

Methods: This study systematically evaluates electronic health records and laboratory management software in healthcare settings. The main objective is to identify the primary variables that lead to data loss and analyse the different preventive techniques used to reduce these risks.

Results: This study primarily focuses on the practical features of electronic health records and laboratory information management systems in medical laboratories. The analysis presented here examines the present condition of these systems, with a particular emphasis on their deployment and utilisation. However, it needs to precisely delve into the specific tactics for mitigating data loss concerns or enhancing patient care.

Conclusion: This study emphasises the crucial significance of electronic health records and laboratory information management systems in medical laboratories, emphasising the relevance of efficient data management.

I. Introduction

The diagnostic services provided by a medical laboratory are essential to the healthcare system since they help detect and identify diseases and conditions. From standard blood testing to more specialised tests, clinical labs gather and analyse clinical specimens to learn about patient health [1]. Medical laboratories are crucial in the healthcare system as they specialise in providing critical diagnostic services for patient care. Unlike research facilities focused on fundamental investigations, these laboratories specialise in delivering prompt and precise diagnostic outcomes that enable treating physicians to make well-informed judgements.

More than 70% of clinical choices depend on laboratory testing. Hence, the significance of medical labs in clinical decision-making cannot be emphasised. Medical laboratories may range in size and complexity, with more extensive and complicated labs often found in hospitals and other major medical facilities. In comparison, smaller labs are more common in doctor's offices, clinics, and long-term care facilities. Private, for-profit medical labs also provide specialised tests that may not be accessible anywhere else [2], [3].

Paper records have long been the standard for keeping track of patients' medical histories, even though this method could be more efficient (because to its slowness and fragility), not to mention risky. However, due to computing power developments, hospitals and clinics may now use electronic systems to track patient data [4]. The fundamental objective of such systems is to facilitate the smooth and quick recording, retrieval, and alteration of patient medical records to enhance the quality of treatment provided to patients. The safety and security of a computerised system further increase the value of keeping data there [5].

The graphical user interface of these systems allows doctors to retrieve patients' records rapidly and efficiently. However, like with any computer-based system, data loss is always possible due to hardware failure or software corruption. Protecting sensitive patient data requires regular backups to be kept off-site [6], [7].

Better patient care has resulted from the use of computerised technologies that streamline medical records management. These solutions provide an intuitive interface and safeguard information against deletion, corruption, or other forms of loss. Important patient data must be protected at all costs; hence, it is essential to regularly back up the software [8].

A. The Aim of the Article

This article aims to study the potential for information loss in electronic health records, specifically inside laboratory information management systems. This research will assess the present electronic health record (EHR) and laboratory management software (LMS) implementations in healthcare organisations and identify their strengths and drawbacks. This study will also investigate the root causes of data loss, such as hardware malfunctions and software corruption, and how these may affect patient care and hospital operations. The research will pinpoint measures, such as routine backups and disaster recovery plans, that may reduce the probability of data loss. This article examines the subtle benefits and possible complications associated with implementing and incorporating Electronic Health Records (EHR) and laboratory management software in hospitals. It highlights how these technologies improve operational effectiveness and patient treatment while acknowledging possible difficulties. Lastly, the research will suggest ways healthcare institutions might enhance their use of electronic health records (EHRs) and laboratory management systems to reduce the likelihood of data loss while increasing productivity and efficiency. The overarching goal of the research is to aid continuing initiatives to boost healthcare quality by using cutting-edge technologies and efficient data management procedures.

B. Problem Statement

Patient data management has been changed due to the introduction of computerised medical record tools in medical institutions. These systems make it simple to obtain information about patients and streamline the processes that take place in hospitals. However, the potential danger of loss of data in these systems is a severe worry since it is possible for crucial patient data to be lost as a consequence of hardware failures or software corruption. The effects of such a data loss may negatively influence patient care and the workflows inside a hospital, in addition to having legal and financial ramifications. As a result, it is vital to research the risk of data loss in computerised medical record systems and find appropriate solutions to reduce these risks. Moreover, studying the danger of data loss in computerised medical record systems is essential. This declaration of the problem draws attention to the need to do more research to solve this severe problem and protect client records' confidentiality, safety, and accuracy.

II. Literature Review

The primary aim of this study is to comprehensively investigate the obstacles and potential dangers linked to data loss in computerised medical record systems. Unlike a broad examination of medical laboratory operations, this analysis explicitly emphasises the crucial role of electronic records in healthcare. The comprehensive collection of these records, which includes patient diagnostics and treatment histories, plays a crucial role in the present medical environment. We focus on comprehending the influence of administration, security, and potential vulnerabilities of these digital data on patient care and healthcare operations. This literature review explores several aspects of data loss in medical record systems, including its causes, effects, and measures to prevent it. This review emphasises the need for solid data protection and integrity measures to guarantee the dependability and efficiency of healthcare services by analysing relevant studies and practical situations [9], [10]. Also covered are the many kinds of laboratories, the people who work in them, and the language used to create the software that runs them [11], [12].

This article's approach is based on a survey of the existing literature on the topic. The study strategy included a literature search of appropriate academic publications, medical periodicals, and the Internet [13]. Data utilised in this article were culled from reputable online resources, including PubMed, Science Direct, and Google Scholar. Articles were evaluated for their usefulness, credibility, and validity.

The article starts by defining medical labs and outlining their functions. Medical labs vary in size and complexity and provide various diagnostic procedures. Seventy per cent of healthcare decisions, according to the paper, depend on laboratory tests [14].

The article continues by discussing the many divisions inside a medical laboratory. Laboratory medicine is provided at healthcare facilities such as hospitals and other patient care settings by the Department of Pathology and Medical Laboratory, which is frequently divided into two divisions. Histopathology, cytopathology, clinical microbiology, clinical chemistry, haematology, blood banking, molecular diagnostics, reproductive biology, and urinalysis are just a few examples of the many subspecialties that make up medical labs, as the article goes on to detail. The article covers these topics and their associated duties in depth [15].

The medical laboratory technicians are also included in this piece. Pathologists, clinical biochemists, laboratory assistants, biomedical scientists, medical laboratory technicians, medical laboratory assistants, phlebotomists, and histology technicians may work in clinical labs. The roles of each employee are summarised in the article [16].

The many classifications of labs are then discussed. Most medical samples in developed countries are processed by one of two main kinds of laboratories. Patients of the affiliated hospital are the primary subjects of testing performed by hospital labs. Private (or community) labs analyse samples from general practitioners, insurance companies, clinical research centres, and other medical clinics. It is possible for a research facility to obtain samples intended for targeted analysis [17], [18].

The study wraps up by talking about the language used to create the software for hospitals and clinics. Visual Basic.NET is the name of the language. The article describes how VB.NET, as an object-oriented language, was designed to be accessible to programmers of all skill levels. The pros and downsides of using VB.NET as a programming language are outlined in this article [19], [20].

This article explores the complexities of data management and safeguarding in computerised medical record systems. This section focuses exclusively on comprehending the intricacies of storing, processing, and protecting electronic health information rather than offering a comprehensive overview of medical laboratories. We will examine various digital record-keeping

systems, the responsibilities of healthcare IT professionals in maintaining these systems, and the programming and technological frameworks necessary for assuring the security and accuracy of data. The primary emphasis will be on the diverse susceptibilities these systems encounter, encompassing hardware and software malfunctions, cybersecurity risks, and human fallibility, and how these elements might result in data loss with substantial ramifications for patient care and healthcare operations. This comprehensive analysis offers a deep comprehension of the crucial significance of strong data protection measures in the digital healthcare setting [21]. The research presented here systematically examined relevant literature from academic journals, medical periodicals, and the Internet [22]. Data utilised in this article were culled from reputable online resources, including PubMed, Science Direct, and Google Scholar [23].

The combination of Electronic Health Records (EHR) and Laboratory Information Management Systems (LIMS) enables continuous patient monitoring beyond individual physician visits. It provides a comprehensive perspective on a patient's health journey, collecting data from several encounters within the healthcare system. This integration facilitates a continuous storyline of a patient's well-being, essential for managing chronic illnesses. In this context, long-term trends and patterns in data provide more valuable insights than individual readings [24].

Furthermore, consolidating data from many platforms, such as wearable technologies and patient-reported outcomes, improves the ability to monitor patient advancement thoroughly. Data convergence facilitates a more comprehensive comprehension of a patient's health, allowing for tailored treatment strategies and proactive interventions.

The integration offers the advantage of predictive analytics, which employs historical and real-time data to anticipate health patterns. By examining long-term patterns, healthcare providers can predict the worsening of chronic illnesses, possible consequences, and the necessity for medical interventions. This allows for a shift in approach from reactive to preventative care.

Thus, prioritising the ongoing and extended aspects of patient monitoring, as described in the mentioned book's discussion on the development and monitoring stages, not only improves patient care but also plays a vital role in advancing healthcare systems towards more anticipatory, tailored, and proactive models [25].

III. METHODOLOGY

An additional study on the present status of electronic health records and laboratory management software in medical institutions is required to study the danger of data loss in computerised medical record systems. It must examine the hazards of using electronic health records (EHR) and lab management software, determine how to lessen those hazards and show how healthcare facilities might profit from those solutions and best practices. To guarantee accuracy and relevance, the research must take appropriate measures to protect the privacy of patient information, entail participation from all necessary parties, and be carried out as soon as possible.

A. The Backbone of Laboratory Operations

A team of workers with different skills and backgrounds does clinical laboratory work. These individuals play crucial roles in ensuring the smooth functioning of medical laboratories and are essential for accurate diagnoses and quality patient care [26], [27]. The staff of clinical laboratories includes:

1. Pathologists are medical doctors who specialise in diagnosing diseases by examining tissues, blood, and other bodily fluids. They are critical in interpreting test results and providing valuable insights into patient health [28].

2. Clinical biochemists are experts in analysing and interpreting biochemical components in bodily fluids. They contribute to diagnosing and managing various diseases by evaluating test results related to metabolism, hormones, and enzymes [29].

3. Laboratory assistants support the laboratory team by performing various tasks, including sample preparation, data entry, and equipment maintenance. Their contributions are vital to the efficiency of laboratory operations [27].

4. Biomedical Scientist (BMS), Medical Laboratory Scientist (MT, MLS, or CLS), or Medical Laboratory Technologist (MLT) in the US, or Medical Laboratory Technologist in Canada: These professionals are involved in conducting and analysing medical tests, interpreting results, and assisting with research and development of new diagnostic methods. They are instrumental in ensuring accurate and reliable laboratory results [30].

5. Medical Laboratory Technician/Clinical Laboratory Technician (MLT or CLT in the US): Medical laboratory technicians perform routine laboratory tests, analyse samples, and maintain laboratory equipment. Their work supports the work of technologists and helps provide timely test results [30].

6. Medical laboratory assistants support laboratory operations by performing clerical and administrative tasks, ensuring a smooth workflow, and assisting with sample handling [31].

7. Phlebotomists specialise in drawing blood samples from patients for diagnostic testing. Their expertise in venipuncture is essential for obtaining accurate specimens [32].

8. Histology technicians prepare tissue samples for examination under a microscope, assisting pathologists in diagnosing diseases and conditions based on cellular and tissue characteristics [33].

These professionals work collaboratively as a cohesive team to process and analyse clinical specimens, produce accurate test results, and contribute to patient care and treatment decisions. Their knowledge and attention to detail are essential for finding and treating various sicknesses, from infectious diseases to long-term conditions.

The area of medical laboratory science is constantly changing, as new technologies and testing methods lead to better care for patients. As mentioned in reference, medical laboratories are witnessing increasing demand, leading to personnel shortages in certain areas. Laboratory workers must

keep learning and training to keep up with new changes and give customers the best service possible [34].

The clinical laboratory workforce comprises pathologists, clinical biochemists, laboratory assistants, biomedical scientists, medical laboratory technicians, medical laboratory assistants, phlebotomists, and histology technicians.

Their expertise, dedication, and collaborative efforts are indispensable in providing accurate and reliable diagnostic results, ultimately contributing to the well-being and treatment of patients. As medical technology advances, the importance of a highly skilled and knowledgeable laboratory team becomes even more significant in modern healthcare settings [35].

B. Medical Specimen Processing

In developed countries, two main types of labs manage medical data processing. Hospital labs cater to patients affiliated with the hospital and are responsible for conducting essential tests relevant to their medical needs [36, 37]. On the other hand, private or community labs focus on analysing samples sent to them by primary care physicians, insurance companies, clinical research centres, and various other medical clinics. Additionally, some research facilities can receive samples intended for targeted analysis.

Specific specialised tests may require samples to be sent to multiple facilities in certain situations. For instance, a laboratory may choose to specialise in less frequent testing. In such cases, they may receive specimens (and revenue) from other labs for these specific tests while sending out other specimens to different labs to conduct tests they do not perform [38]. This arrangement allows for a more cost-effective and efficient distribution of specialised testing capabilities.

When comparing different countries, a significant disparity exists in the range of investigations conducted in medical laboratories. The Red Cross, crucial in supplying blood products for hospital transfusions, offers its customers access to its reference laboratory [39]. Such reference laboratories ensure the highest quality of blood products and enhance patient safety during transfusions.

In specialised testing, some laboratories focus on molecular diagnostic and cytogenetic testing, contributing to identifying and treating genetic or cancer-related disorders. These advanced testing techniques are vital in providing personalised and targeted treatment options to patients with complex medical conditions [40].

C. Technical infrastructure and security measures in medical record systems.

To adequately address the technological complexities, it is essential to examine the fundamental technical infrastructure and its constituent parts thoroughly. The data architecture of these systems usually consists of multiple layers, including data collection, storage, processing, and dissemination. This architecture optimises data flow while upholding data integrity and confidentiality principles.

The data flow mechanisms in medical record systems adhere to a rigorous protocol. Data is initially acquired through many interfaces, such as electronic health records (EHR) and laboratory information systems (LIS). Subsequently, this data is securely transported to centralised servers for storage and processing. Secure protocols such as HTTPS or VPN tunnels are commonly used in transmissions to protect data while it is being transferred.

Encryption is crucial for ensuring the security of sensitive data. During periods of inactivity, data undergoes encryption using sophisticated algorithms such as AES-256, which is highly resistant to unauthorised access given current technological capabilities. SSL/TLS encryption is used during transmission to thwart interception and unauthorised access. Using dual-layer encryption guarantees confidentiality and security for sensitive patient data during transmission and storage.

Access control is a crucial component. Systems utilise strong authentication measures, such as multi-factor authentication (MFA), to confirm the identity of users accessing the system. RBAC enhances security by restricting users' access to data and tasks relevant to their specific role, reducing the likelihood of unauthorised access or data breaches.

Ultimately, the security mechanisms included in these systems are thorough and all-encompassing. The measures encompass routine security audits, ongoing surveillance for potential threats, and compliance with regulatory standards such as HIPAA in the United States. These policies are crucial for safeguarding against external risks, such as hacking or phishing assaults, and internal threats, such as unauthorised access or unintentional data loss.

The technical structure of computerised medical record systems is constructed to be strong, protected, and practical, guaranteeing the secure management of confidential medical information while meeting the essential requirements of healthcare providers and patients.

D. VB.NET Limitations

Visual Basic.NET (VB.NET) is a programming language developed by Microsoft, and it was introduced in 2002 with the primary purpose of succeeding Visual Basic 6. VB.NET is fully object-oriented, which is different from its predecessor. Its polymorphism, abstraction, isolation, support inheritance, and other essential aspects of object-oriented programming (OOP).

The language is based on the.NET framework, providing full access to all.NET libraries, enabling the rapid development of online, Windows, Office, and mobile applications [41], [42].

One of the best things about VB.NET is that it is meant to be easy for coders of all levels to learn. It offers reliability and scalability as programs written in VB.NET run on the.NET framework. Additionally, developers can create completely object-oriented applications comparable to those built with other languages like C++, Java, or C#. VB.NET applications are compatible with those written in Visual C++, C#, and J#.

Fig. 1. Icon VB.NET

VB.NET boasts several features that contribute to its popularity among programmers worldwide [43]. Some of these features include:

- *Case Insensitivity:* VB.NET does not care about which, unlike other computer languages such as C++ and Java, renders it more accessible to code in.
- *Object-oriented:* In VB.NET, everything is seen as an object, making it easier to use computing techniques focusing on objects.
- *Auto-formatting of Code:* VB.NET includes automated code formatting, making it easier for developers to generate professional-quality code with less effort.
- *Garbage Collection:* The language automates garbage collection, managing memory usage efficiently.
- *Boolean Decision-making:* VB.NET provides strong support for Boolean decision-making criteria.
- *Essential Multithreading:* VB.NET lets you make multithreaded apps, which can simultaneously do more than one thing.
- *Fundamental Generics:* The language supports generics, allowing for the creation of type-safe and reusable code components.
- *Standard Library:* VB.NET includes a standard library that provides numerous pre-built functionalities.
- *Event Management:* The language offers robust event-handling capabilities for building interactive applications.
- *References:* VB.NET allows developers to create references to external objects, enabling seamless integration of external resources.
- *Attributes:* Developers can use attributes as tags to describe entities within a program, enhancing code documentation and metadata.

VB.NET comes with Windows Forms, which enables developers to inherit forms from existing ones, streamlining the form creation process [44]. The language also supports docking, automatic control anchoring, and in-place menu editing, making it popular among app developers. While VB.NET offers numerous advantages, it does have some drawbacks. The language lacks direct handling of references, which may lead to more lines of code and potentially slower processing [44]. Despite this, VB.NET remains a popular choice due to its ease of learning, the vast pool of potential employees, and its ability to communicate with applications written by others. NET-based languages.

E. VB.NET Namespace Declaration Understanding

A namespace declaration in VB.NET allows you to use classes, interfaces, and methods from a third-party library or framework. The System namespace is an integral aspect of the.NET framework that may be used for various purposes, including but not limited to operating system manipulation, input/output, networking, and more.

```
Imports System 1
0 references
Module Module1 2
    ' Prints Hello Guru99 3
    0 references
    Sub Main() 4
        Console.WriteLine("Hello Guru99") 5
        Console.ReadKey() 6
    End Sub 7
End Module 8
```

Fig. 2. VB.NET Code

In Visual Basic.NET, a module declaration creates a library that other application portions may access and utilise. A set of connected processes and functions that work together to accomplish a specific goal. Procedures in a module may either be made public so they can be called from anywhere in the program or kept private so they cannot be called from anywhere.

A VB.NET procedure is a collection of instructions for carrying out a particular activity. Subs and Functions are only two examples; more exist, and they all have unique abilities and parameters. Modularising code by defining classes and subroutines is a good practice for readability and maintainability [45].

In Visual Basic for.NET, the WriteLine method of the Console class may be used to send a single line of text to the system's default output. The Console class and the other classes and methods declared in the System namespace may be accessed using an import. Effectively jotting down text in the terminal window is now a breeze.

The code incorporates a method of preventing the program from terminating prematurely so that it may be closed once it executes. When a user clicks the "X" to close a window, you may show them a message or ask them to do some action before it closes. If you want to stop a program correctly and free up any resources it may have utilised, you need to close the main sub-procedure and finish the module.

IV. RESULTS

The latest release of Visual Basic.net includes support for creating windows that perform particular duties and the ability

to design systems for managing institutions. Because of this, the system may be tailored to meet the institution's unique requirements, improving its efficiency and effectiveness. Moreover, Excel may be a database to store and retrieve information. This facilitates easy data input, quick retrieval, and organised data management. As seen in Fig. 3, the final format results in a tidy presentation of the data that is simple to read and understand. Using Visual Basic.net to build institutional management systems that employ Excel as a database is a robust and efficient data management and retrieval approach.

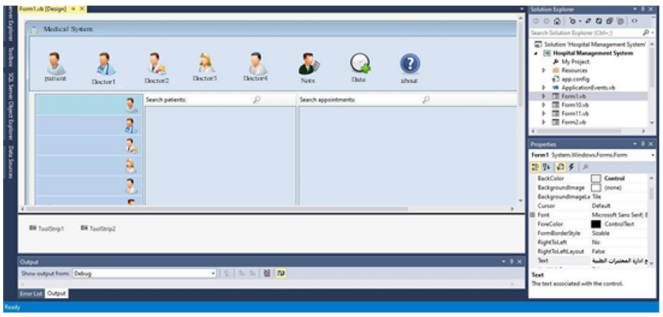

Fig. 3. Final format

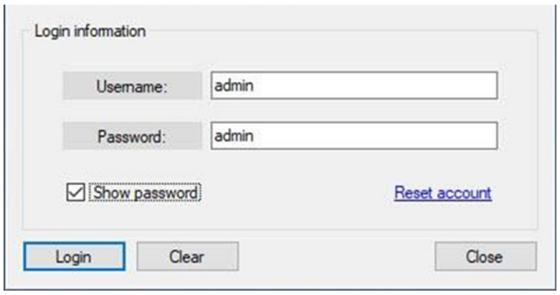

Fig.4. Form to input information

You can also change the password by (Reset Account) the password and type the new number.

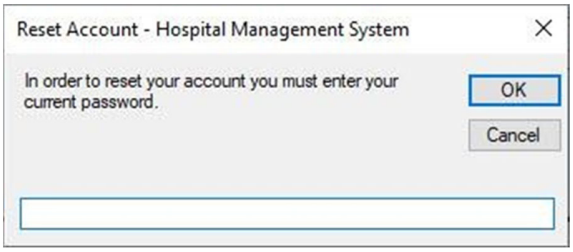

Fig.5. Reset Account

Fig. 5 illustrates resetting an account's credentials in the Hospital Management System. Typically, users must input their existing password to confirm their identity before they can establish a new password. Resetting an account is essential for upholding data security by controlling access to sensitive patient information in EHR and LIMS. It also ensures that credentials are regularly updated to avoid unauthorised access. This measure ensures the confidentiality of patient information and maintains the system's integrity.

Patient information is added to the program forms by entering information such as the patient's identification number, name, date of birth, gender, mailing address, phone number, and results of any diagnostic procedures. After the user has entered the patient's information, they may click the "Add" button to add the patient to the program's list and database. The patient-adding interface, shown in Fig. 6, is simple, making it easy for the user to enter all required data.

Doctor information may be entered into the application by completing the forms in Fig. 7. The contact information for the doctor is stored in these sections. When the user inputs the doctor's information, they may add him or her to the program's database by clicking the Add button. Because of this function, medical facilities like hospitals and clinics may more easily keep track of their doctors' records.

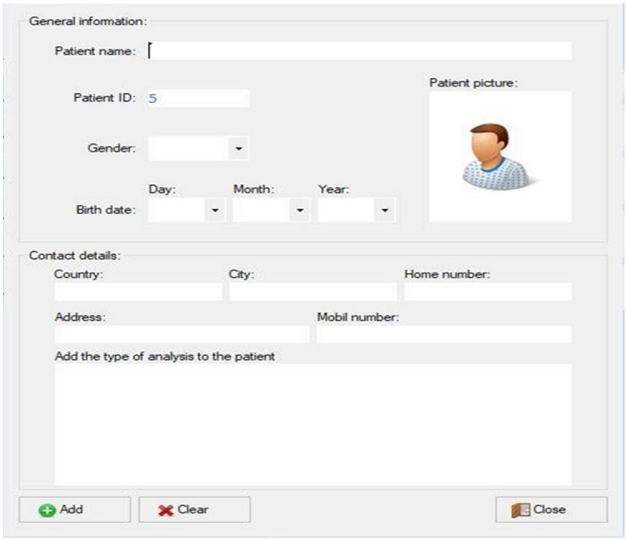

Fig. 6. Adding a patient

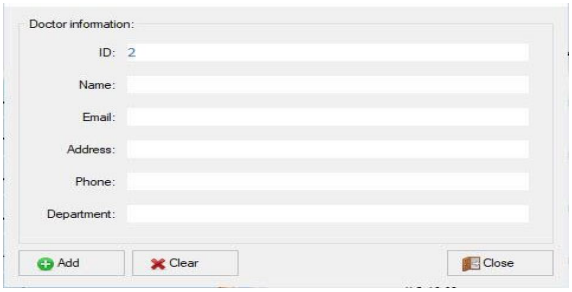

Fig. 7. Adding doctor information

The image in Fig. 8 displays the interface for adding information about pharmacists in a hospital or medical clinic. The form requires the user to input the pharmacist's number, name, email, address, and department. Once all the required information has been entered, the user can click the Add button to add the pharmacist's information to the program's database. This feature allows for easy management and retrieval of pharmacist information, which can be critical in providing optimal patient care.

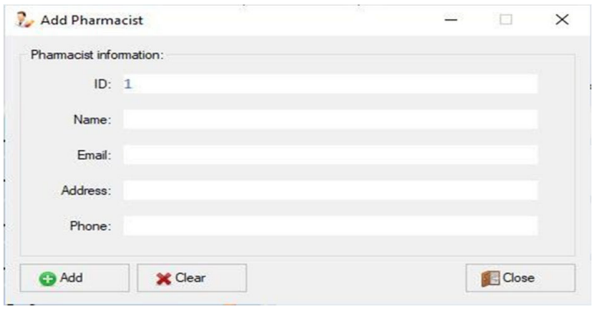

Fig. 8. Adding pharmacist

When adding a nurse to the system, customers will be asked for various identifying information, such as the nurse's name, contact information (including email and physical addresses), and mobile phone number. After the user has input all the pertinent information about the nurse, they may click the Add button to add the nurse to the program's list and database. This facilitates the efficient management of nursing personnel in a hospital or medical clinic by allowing quick access to relevant nurse information when required.

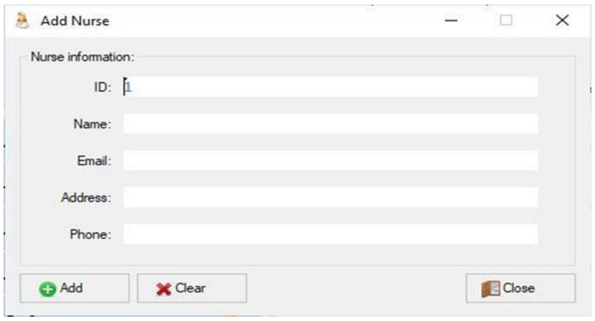

Fig.9. Adding information about nurse

The software can be utilised by medical facilities to store information on laboratory physicians. The application has spaces for the user to enter the laboratory doctor's phone number, name, email address, and physical and electronic addresses. After the user has provided all the pertinent data, they may add the laboratory physician's details by clicking the Add button. This function makes effective administration of laboratory physicians' data possible, simplifying keeping track of personnel records and delegating responsibilities as required. The program's straightforward layout and data entry method make it a valuable resource for the administration of healthcare facilities.

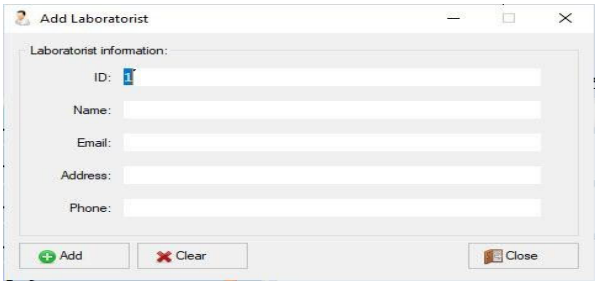

Fig.10. Adding a laboratories

There are places in the software where the accountant's number, name, email, address, and cell phone may be entered, making it possible to keep track of their contact details at a medical facility. After the user has finished entering the necessary data about the accountant, they may click the Add button to add the accountant to the program's list and database. As seen in the image, the accountant data entry form follows the pattern shown.

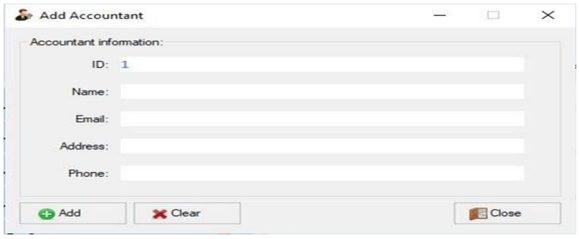

Fig.11. Adding accountant

An essential part of the application is the scheduling option, which can be used to set aside time for a doctor to evaluate results from a lab or examine the patient in general. The reservation date and time are automatically populated after the patient's name is selected from the program's database. This function not only helps manage patient appointments but also helps avoid duplicate bookings and other scheduling issues. This feature is helpful since it streamlines patient appointment management and is simple to implement.

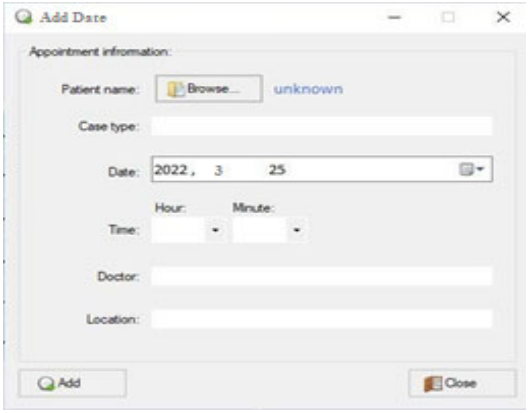

Fig.12. Adding a reservation

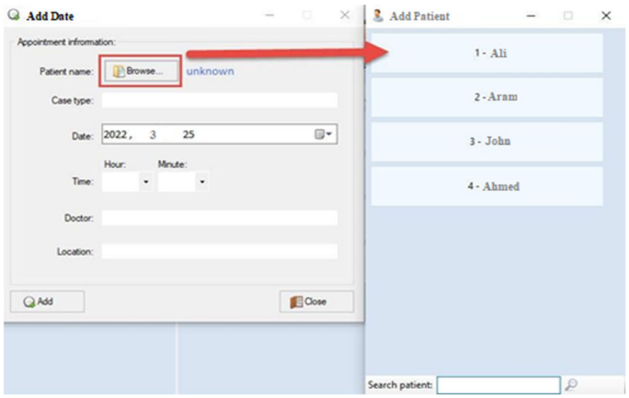

Fig.13. Adding a reservation for the patient

The picture shows the program information, the student's name, the supervising professor's name and the un, university's name.

Hardware failure, software problems, cyber-attacks, and human mistakes are only a few of the causes of data loss. Information loss in the healthcare sector is especially disastrous since it often includes patients' private and sensitive data. Attacks using ransomware are a potential danger. As a kind of malware, ransomware is designed to encrypt data on infected computers and withhold access until a ransom is paid in full. Hackers can target healthcare institutions and demand money in return for decrypting encrypted data. Significant monetary loss and reputational harm may arise from these assaults on healthcare institutions.

Unauthorised access to patient information is another source of possible data loss. Healthcare providers are responsible for restricting access to patient information to only those who need it to deliver treatment. Otherwise, legal ramifications and a loss of confidence might result from a breach of patients' privacy. In addition, medical facilities need to have reliable data backup mechanisms in place. Patients' health might be jeopardised if crucial information is lost due to a hardware breakdown.

Many safeguards may protect sensitive patient information and lessen the blow of any accidental deletions or corruptions at healthcare facilities. Hospitals and other medical centres must establish reliable data backup and restoration procedures as a first step. To safeguard data accessibility in case of hardware failure, performing frequent backups to an off-site location or the cloud is recommended. Furthermore, it would help if you run some data recovery tests every so often to ensure your backup is doing what it should.

Second, hospitals and other medical facilities must set up sufficient safeguards to protect patients' personal information. Methods such as encrypting sensitive information and using multiple authentication factors fall under this category. Furthermore, by conducting frequent security audits, healthcare providers better understand where their systems are vulnerable and where they can improve security.

Finally, hospitals and other medical facilities should ensure they have solid backup procedures in an emergency. These strategies should include protocols for resolving data loss occurrences, recovering lost information, and informing patients. Moreover, healthcare providers in the United States must verify that they follow the Health Insurance Portability and Accountability Act (HIPAA) and other privacy laws and recommendations.

When patients or doctors experience a data breach in electronic medical record systems, it may have severe consequences for them and their treatment. As a result, healthcare organisations must implement safeguards like disaster recovery plans, data backup and recovery systems, and robust security protocols to protect sensitive patient information. Compliance with applicable legislation and standards is crucial to safeguard patient privacy, and regular security audits may assist in detecting weaknesses in the system. By adhering to industry standards, medical professionals may protect their patients' information and reduce the likelihood of data loss.

V. Discussion

While computerised medical record systems have many benefits, such as increased efficiency, accuracy, and accessibility, they also pose risks related to data loss. These risks may include cyber-attacks, hardware failures, and human error. To mitigate these risks, healthcare institutions must implement robust data backup and recovery plans, cybersecurity measures, and training programs for staff. Regular testing of backup and recovery plans is also essential to ensure their effectiveness in an emergency.

Furthermore, healthcare providers should consider implementing a hybrid system that combines electronic and paper-based records to minimise the impact of data loss. This can ensure that critical patient information is still available in case of a system failure or cyber-attack.

It is also crucial to adhere to data protection regulations such as HIPAA and GDPR to ensure patient privacy and prevent unauthorised access to sensitive medical information. Data encryption, access controls, and monitoring tools can also help prevent data breaches.

While computerised medical record systems offer many benefits to healthcare providers and patients, the risk of data loss cannot be ignored. Therefore, healthcare institutions must implement comprehensive data protection measures and backup plans to safeguard critical patient information. By taking a proactive approach to data security, healthcare providers can minimise the impact of data loss and ensure high-quality patient care.

The article provides a comprehensive overview of medical laboratories and their functions, aiming to shed light on the potential risk of data loss in computerised medical record systems. The research draws information from systematically examining relevant literature from academic journals, medical periodicals, and reputable online resources like PubMed, Science Direct, and Google Scholar [13]. The survey-based approach ensures the credibility and validity of the data.

The article begins by defining medical laboratories and emphasising their critical role in healthcare. These facilities serve as essential diagnostic centres where clinical specimens are examined to provide crucial information for patient diagnosis, treatment, and prevention of illnesses [4]. The diversity and complexity of medical labs are highlighted, as they offer a wide range of diagnostic procedures, with approximately 70% of healthcare decisions relying on laboratory test results [5].

The discussion delves into the various divisions within a medical laboratory, focusing on the Department of Pathology and Medical Laboratory, often divided divided main departmedepartmentsrticle, elaborates on subspecialties such as histopathology, clinical microbiology, clinical chemistry, haematology, and molecular diagnostics [6]. Each subspecialty's roles and responsibilities are thoroughly covered,

providing a holistic understanding of the workings of medical labs.

The article also highlights the critical personnel in medical laboratories, including pathologists, clinical biochemists, laboratory assistants, biomedical scientists, medical laboratory technicians, medical laboratory assistants, phlebotomists, and histology technicians. By summarising the roles of each employee, readers gain insights into the contributions of these professionals to the efficient functioning of medical labs.

The article discusses the different classifications of medical laboratories, focusing on the two main types commonly found in developed countries: hospital labs and private (or community) labs. Hospital labs primarily cater to patients of the affiliated hospital; Private labs get samples from doctors, healthcare providers, and other medical offices [11]. Additionally, research facilities may also obtain samples for targeted analysis.

The paper highlights the programming language used to create software for hospitals and clinics. Visual Basic.NET (VB.NET) is discussed as an object-oriented language designed to be accessible to programmers of all skill levels. The pros and cons of using VB.NET in the medical field are examined, shedding light on the significance of software language selection in medical record systems [24].

This article offers an informative and comprehensive understanding of medical laboratories, from their diverse divisions and personnel roles to the different types of labs and the programming language utilised for software development [14]. The research methodology ensures reliability and credibility. It is a valuable resource for readers seeking insights into medical laboratory operations and the potential risks of data loss in computerised medical record systems. The article's utilisation of reputable sources and systematic literature search further enhances its reliability and relevance to the medical community.

VI. Conclusions

This article describes why hospitals and other healthcare institutions must adopt computerised systems to provide better patient care. The essay focuses on the benefits that these systems provide. It has been shown that maintaining patient records on paper is a method that could be more efficient and convenient. Because of the development of sophisticated computerised patient record-keeping systems, medical professionals and hospitals can now save, retrieve, and maintain their patients' medical records up to date in a fraction of the time it used to take.

The app that is being highlighted in this piece serves as an illustration of how digital technology may be utilised to enhance the management of medical information. The intuitive graphical user interface and the extra panes make it easy to add patients and people from the hospital or laboratory to the program. The application saves this information in its database to be used later.

Since they provide essential diagnostic services that contribute to the early diagnosis, treatment, and prevention of diseases, medical laboratories are often cited as essential to the overall healthcare system. Since the outcomes of laboratory tests influence more than 70% of clinical decisions, laboratories play an essential part in providing these services.

In addition, the article emphasises the significance of maintaining the confidentiality of patient information stored in computerised databases. Even though computer-based solutions offer a straightforward user interface and enhance the level of care provided to patients, there is always the potential that data might be lost due to a malfunction in either the hardware or the software. As a consequence of this, it is essential to perform frequent software. As a consequence of this, it is essential to perform frequent backups of the application in order to safeguard important patient data.

The broad use of computing technology inside medical facilities has been primarily responsible for the enhancements to patient care and the overall quality of treatment. The development of electronic systems for the recording of patient data has simplified the administration of medical records. As a result, it is now much easier to access patient information and make any necessary updates to it. When the medical industry adjusts to accommodate new technology, the quality of care provided to patients will be maintained and, if possible, even enhanced.

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