RAFIK HARIRI UNIVERSITY

PATIENT-PHYSICIAN PORTAL MEDICAL TESTS AND BILLING SYSTEM

Done By

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Submitted to

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ABSTRACT

The increasing demand for remote healthcare services has led to the development of various telemedicine solutions, including web-based platforms for medical test results and bill management. In this project, we developed a web-based platform that allows patients to perform radiology, laboratory, or COVID-19 tests and physicians to upload the results. The platform also includes a billing system that enables patients to view and pay their bills online. The system provides a user-friendly interface for patients and physicians, ensuring easy access to medical test results and bill information. I developed the platform using PHP, HTML, CSS, JSON, and JavaScript, and created a database on a localhost server to store patient and test data. To validate the functionality of the platform, we conducted a series of tests to ensure that all features were working as expected. Our results show that the platform provides a reliable and efficient means of managing medical test results and bills remotely, while ensuring the privacy and security of patient data. The system has the potential to revolutionize healthcare services by making them more accessible, convenient, and affordable for patients, and more efficient for physicians. We believe that my work represents a significant step forward in the development of telemedicine solutions and can contribute to improving healthcare services worldwide.

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CHAPTER 1

INTRODUCTION

Telemedicine has emerged as an essential tool for delivering healthcare services remotely, particularly in light of the COVID-19 pandemic. The use of telemedicine technologies has expanded rapidly in recent years, making it possible to offer patients more accessible, convenient, and cost-effective healthcare services. One of the critical components of telemedicine is the ability to manage medical test results and bills remotely, enabling patients to monitor their health and access medical care from the comfort of their homes.

The purpose of this project is to develop a web-based platform that allows patients to perform radiology, laboratory, or COVID-19 tests and physicians to upload the results. The platform also includes a billing system that enables patients to view and pay their bills online. By creating an easy-to-use platform that empowers patients to manage their medical test results and bills, we aim to improve the quality and efficiency of healthcare services while reducing costs and improving accessibility.

The demand for telemedicine solutions has grown rapidly in recent years, driven in part by the rise of digital technologies and the increased availability of high-speed internet connections. According to recent estimates, the global telemedicine market is expected to reach over $175 billion by 2026, representing a compound annual growth rate of over 15% (1). Telemedicine has the potential to revolutionize the healthcare industry by making medical services more accessible, efficient, and affordable for patients.

The importance of telemedicine has been particularly evident during the COVID-19 pandemic, where social distancing measures have made it difficult for patients to access healthcare facilities in person. In response, healthcare providers have turned to telemedicine technologies to provide patients with medical care remotely. Telemedicine technologies can enable healthcare providers to monitor and treat patients with chronic conditions, offer mental health services, and provide remote consultations.

In this project, we developed a web-based platform that enables patients to perform medical tests remotely and access their results and bills online. I designed the platform to be user-friendly, allowing patients and physicians to access their data quickly and easily. The platform includes several features, such as a billing system that enables patients to pay their bills online, a medical record system that allows patients to view their medical history, and a secure messaging system that enables patients to communicate with their physicians.

The remainder of this report is structured as follows. Chapter 2 provides a review of the existing literature on telemedicine and medical test result management. Chapter 3 describes the design and implementation of our platform, including the system architecture, database schema, and user interface. Chapter 4 presents the results of my testing and evaluation, highlighting the strengths and limitations of the system. Finally, in Chapter 5, We provide a summary of my contributions and suggest areas for future work.

CHAPTER 2

LITERATURE REVIEW

2.1 Overview of the Healthcare System

The healthcare industry is an essential part of every society, as it provides medical care and support to people in need. The healthcare system has been evolving rapidly, and with the advancements in technology, it has become more efficient and accessible. However, despite these advancements, there are still many challenges that need to be addressed to improve the quality of care and make it more affordable.

The healthcare system can be broadly categorized into two main components: the provider and the payer. The provider includes all the medical professionals, hospitals, clinics, and other healthcare facilities that offer medical services to patients. The payer, on the other hand, includes insurance companies, government-funded programs, and individual patients who pay for medical services out-of-pocket.

The healthcare system is facing numerous challenges, including rising costs, limited access to care, and the need for improved patient outcomes. One significant challenge is the increasing demand for medical services due to population growth and aging, which has led to a shortage of medical professionals and resources. This demand is further exacerbated by the rising prevalence of chronic diseases, which require ongoing medical care and support.

The healthcare system has also been facing challenges in terms of access to care, particularly for underserved populations such as rural areas, low-income communities, and ethnic minorities. These populations face barriers to accessing healthcare, including financial constraints, transportation issues, and limited access to medical facilities.

In recent years, there has been a push to improve the quality of care by implementing electronic health records (EHRs) and other technology-enabled solutions. EHRs are digital records of patients' medical histories, including diagnoses, medications, lab results, and other

clinical information. EHRs can improve the quality of care by providing healthcare professionals with real-time access to patients' medical records, reducing medical errors, and improving care coordination.

In summary, the healthcare system is a complex and essential component of every society. While it has been facing numerous challenges, technological advancements, such as EHRs, have the potential to improve the quality of care and make it more accessible and affordable.

2.2 Electronic Health Records (EHRs)

Electronic health records (EHRs) are digital records of patients' medical histories, including diagnoses, medications, lab results, and other clinical information. EHRs have been gaining popularity in recent years as a way to improve the quality of care and enhance patient outcomes. EHRs offer several benefits over traditional paper-based records, including real-time access to patient information, improved care coordination, and reduced medical errors.

One of the primary benefits of EHRs is that they allow healthcare professionals to access patient information in real-time. This real-time access to patient information enables healthcare professionals to make more informed decisions regarding patient care, leading to better patient outcomes. For example, if a patient present with a medical condition that requires immediate attention, healthcare professionals can quickly access the patient's medical history and make an accurate diagnosis.

Another benefit of EHRs is that they improve care coordination among healthcare professionals. With EHRs, healthcare professionals can easily share patient information with other healthcare professionals involved in a patient's care. This sharing of information can improve communication, reduce medical errors, and improve patient outcomes.

EHRs also offer several other benefits, including improved accuracy and completeness of patient information, reduced paperwork, and increased efficiency. With EHRs, healthcare professionals can easily track patient information, reducing the risk of errors due to

misplaced or incomplete information. EHRs can also reduce the need for paper-based records, which can be time-consuming and prone to errors.

However, despite the many benefits of EHRs, there are also some challenges associated with their implementation. One significant challenge is the high cost of implementing EHRs, including the cost of hardware and software, training, and ongoing maintenance. Another challenge is the need to ensure patient privacy and security, as EHRs contain sensitive patient information.

2.3 Patient-Physician Communication Systems

Patient-physician communication is an essential aspect of healthcare, as it is crucial for patient satisfaction and treatment outcomes. Patient-physician communication systems are tools that facilitate communication between patients and healthcare professionals, enabling patients to access healthcare services more conveniently and efficiently.

The use of patient-physician communication systems has increased in recent years due to the growing demand for convenient and accessible healthcare services. These systems are designed to provide patients with various services, such as appointment scheduling, prescription refills, and communication with healthcare professionals.

One example of a patient-physician communication system is the patient portal, which is an online tool that enables patients to access their medical records, request appointments, and communicate with healthcare professionals. Patient portals also allow healthcare professionals to communicate with patients, send reminders, and provide educational materials.

Another example of a patient-physician communication system is telemedicine, which allows patients to receive healthcare services remotely. Telemedicine services typically include video consultations, remote monitoring, and mobile health applications that allow patients to track their health and receive feedback from healthcare professionals.

The use of patient-physician communication systems has several benefits, including improved patient satisfaction, reduced healthcare costs, and enhanced treatment outcomes. These systems allow patients to access healthcare services more conveniently, reducing the need for in-person visits and saving both time and money. Patient-physician communication systems also enhance patient engagement and communication, leading to improved treatment outcomes and better patient experiences.

However, there are also some challenges associated with the use of patient-physician communication systems. One significant challenge is ensuring patient privacy and security, as these systems involve the exchange of sensitive patient information. Another challenge is the need for adequate training and support for patients and healthcare professionals, as these systems can be complex and require a significant amount of technical knowledge.

2.4 Comparison between the Competitors and the Proposed System

In recent years, several patient-physician communication systems have been developed to facilitate communication between patients and healthcare professionals. These systems offer various features and functionalities, and it is essential to compare them to determine their strengths and weaknesses.

One of the main competitors of the proposed patient-physician communication system is the patient portal, which is an online tool that enables patients to access their medical records, request appointments, and communicate with healthcare professionals. Patient portals offer several benefits, including improved patient engagement and communication, but they also have some limitations. For example, some patient portals may have limited functionalities, making it difficult for patients to access all the healthcare services they need.

Another competitor of the proposed patient-physician communication system is telemedicine, which allows patients to receive healthcare services remotely. Telemedicine offers several benefits, including improved access to healthcare services, reduced healthcare costs, and enhanced patient convenience. However, telemedicine may not be suitable for all

healthcare needs, and it may be challenging to provide high-quality healthcare services remotely.

The proposed patient-physician communication system offers several advantages over its competitors. The system allows patients to access a range of healthcare services, including radiology and laboratory tests, COVID-19 tests, and medical records, all in one place. The system also offers secure communication channels between patients and healthcare professionals, ensuring patient privacy and confidentiality.

Moreover, the proposed system provides healthcare professionals with a user-friendly interface, allowing them to manage patient information, upload test results, and generate bills quickly and efficiently. The system also offers patients a simple and intuitive interface, enabling them to access their healthcare information easily and communicate with their healthcare providers conveniently.

2.5 Conclusion

In this chapter, we have reviewed the literature on healthcare systems, electronic health records, and patient-physician communication systems, and compared the proposed patient-physician communication system with its competitors.

We have found that patient-physician communication systems can improve patient engagement and communication, leading to better health outcomes. Electronic health records can also improve healthcare quality and efficiency by providing healthcare professionals with access to accurate patient information.

Patient-physician communication systems have several limitations, including limited functionalities and security concerns. However, the proposed patient-physician communication system addresses these limitations by providing patients with access to a range of healthcare services, secure communication channels, and user-friendly interfaces.

The proposed system has the potential to improve patient satisfaction, treatment outcomes, and healthcare efficiency. However, the success of the system depends on several factors, including user adoption, system security, and regulatory compliance.

Overall, patient-physician communication systems have the potential to transform healthcare delivery and improve patient outcomes. The proposed system offers a promising solution to address some of the challenges associated with patient-physician communication, and future research should focus on evaluating the system's effectiveness and scalability.

CHAPTER 3

REQUIREMENTS ANALYSIS

3.1 Functional and Non-Functional Requirements

In this chapter, we will discuss the functional and non-functional requirements of the proposed patient-physician communication system. Requirements analysis is an essential step in the software development process as it defines what the system should do, how it should behave, and what features it should have.

Functional requirements are the system's features and functions that must be present for it to perform its intended purpose. Non-functional requirements are the system's characteristics that define how well it should perform its functions. They include performance, usability, security, and scalability.

The functional requirements of the proposed patient-physician communication system are:

- **User Registration**: The system should allow users to register and create accounts.
- **User Login:** The system should have a login function that allows users to access their accounts.
- **Patient Information Management:** The system should allow physicians to create and manage patient profiles, including personal information, medical history, and laboratory test results.
- **Laboratory Test Management:** The system should allow physicians to record laboratory test orders and results.
- **Radiology Test Management:** The system should allow physicians to record radiology test orders and results.
- **COVID-19 Test Management:** The system should allow physicians to record COVID-19 test orders and results.

- **Billing Management:** The system should allow physicians to create and manage patient bills.
- **Patient Access to Information:** The system should allow patients to access their laboratory, radiology, and COVID-19 test results, medical history, and bills.
- **Secure Communication:** The system should provide secure communication channels between patients and physicians.
- **User Interface:** The system should have a user-friendly interface that is easy to navigate and use.

The non-functional requirements of the proposed patient-physician communication system are:

- **Performance:** The system should be able to handle a large volume of data and users simultaneously.
- **Usability:** The system should be easy to use and navigate for both patients and physicians.
- **Security:** The system should have robust security measures to protect patient data.
- **Scalability:** The system should be scalable and able to accommodate future growth.

In summary, the functional and non-functional requirements of the proposed patient-physician communication system have been outlined in this chapter. These requirements serve as a guide for the software development team to design and implement a system that meets the needs of both patients and physicians.

3.2 Use Case & UML Diagrams

Use cases describe the interactions between the system and the users. The use cases in this project were identified based on the requirements gathered during the previous phase.

The following table lists the patient main use cases of the system:

Use Case ID	Use Case Name	Description
UC1	Patient Login	The patient logs into the system using their username and password
UC2	See Results	The patient can view their test result
UC3	View Profile Medical Record	The patient can view their medical record and profile
UC4	Pay Bill	The patient can view their bill for the tests they have taken
UC5	Change Password	The patient can change his password

Table 1: Patients Use Case

The following table lists the physician main use cases of the system:

Use Case ID	Use Case Name	Description
UC6	Physician Login	The physician logs into the system using their username and password
UC7	Register Patient	The physician can register a new patient by entering their details into the system
UC8	Edit Patient Information	The physician can edit a patient's information if there are any changes
UC9	Delete Patient Information	The physician can delete a patient's information if required
UC10	Fill Laboratory Test Results	The physician can fill in the laboratory test results for a patient
UC11	Upload Radiology Test Image and Report	The physician can upload an image of a patient's radiology test and its report
UC12	Fill Covid-19 Test Results	The physician can fill in the Covid-19 test results for a patient
UC13	Fill Billing Form	The physician can fill in the billing form for a patient and upload it to the system
UC14	Change Password	The physician can change his password

Table 2: Physician Use Case

UML diagrams were created to provide a visual representation of the system's architecture and design. The UML diagrams used in this project are as follows:

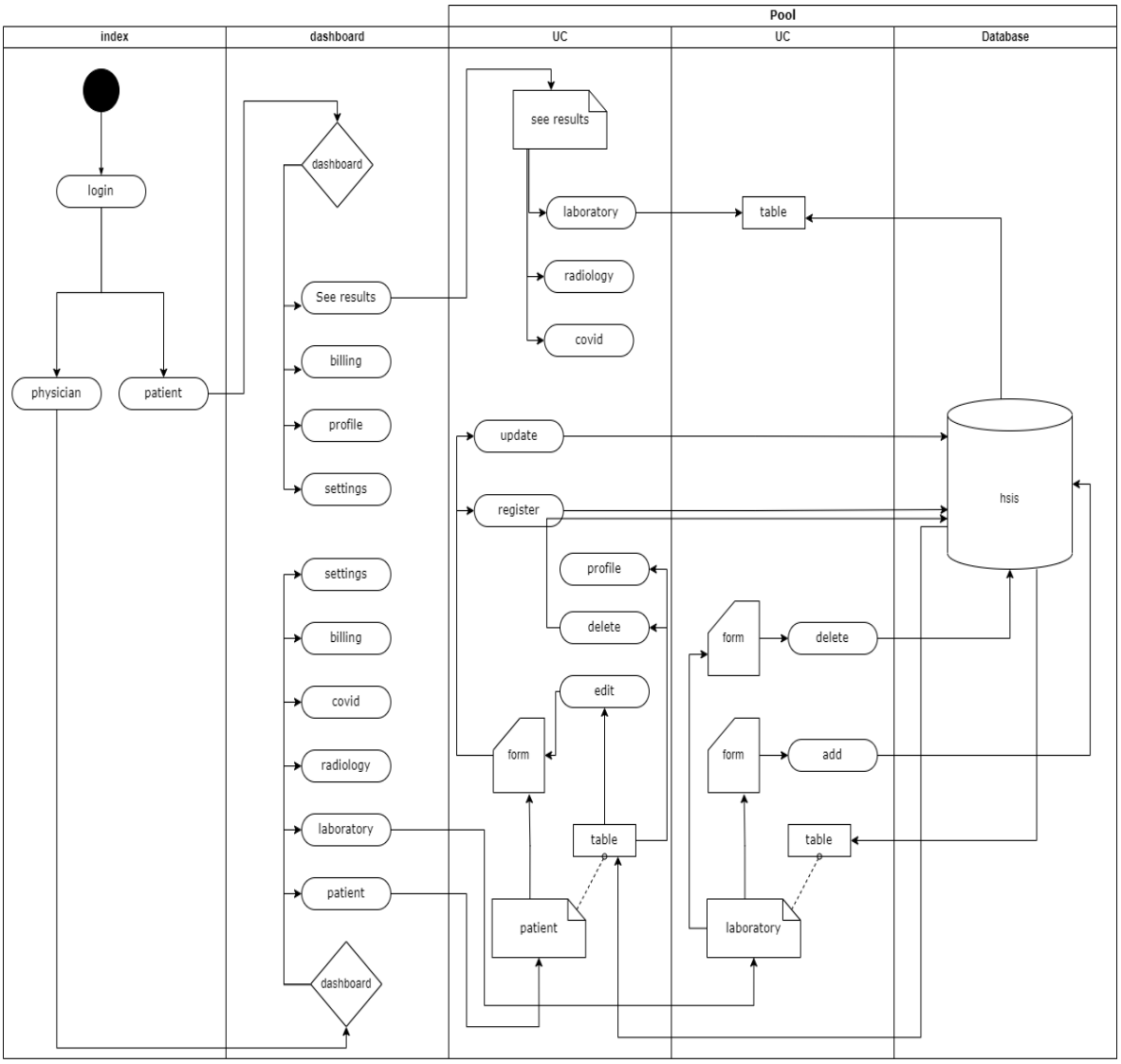


Figure 1: UML Diagrams

CHAPTER 4

SYSTEM DESIGN AND IMPLEMENTATION

4.1 System Architecture

The proposed patient-physician communication system consists of three main components: the patient interface, the physician interface, and the database. The system architecture is

The patient interface allows patients to register, schedule appointments, view test results, and pay bills. The physician interface allows physicians to register, view patient information, upload test results, and generate bills. The database stores all patient information, including personal information, test results, and billing information.

The system is designed to be web-based and accessible through any modern web browser. The system is built using a combination of HTML, CSS, JavaScript, and PHP for the front-end, and MySQL for the back-end database. The system is hosted on a web server, which can be accessed securely using HTTPS.

The system is designed to be scalable and maintainable. The architecture is modular, with clear separation between the front-end and back-end components. This allows for easier maintenance and updates in the future.

Overall, the proposed system architecture is designed to provide a user-friendly and secure patient-physician communication platform that is scalable and maintainable.

4.2 User Interface Design

The user interface (UI) of the patient-physician communication system is designed to be user-friendly and easy to navigate for both patients and physicians. The UI design is based on modern web design principles, with a focus on simplicity, clarity, and consistency.

The patient interface consists of several pages, including a registration page, an appointment scheduling page, a test results page, and a billing page. The registration page allows patients to create an account by providing their personal information, such as name, address, and contact details. The appointment scheduling page allows patients to schedule an appointment with their physician at a convenient time. The test results page allows patients to view the results of their tests, including radiology, laboratory, and COVID-19 tests. The billing page allows patients to view and pay their bills online.

The physician interface also consists of several pages, including a registration page, a patient information page, a test results upload page, and a billing generation page. The registration page allows physicians to create an account by providing their personal information and credentials. The patient information page allows physicians to view their patients' personal information, medical history, and test results. The test results upload page allows physicians to upload the results of their patients' tests, including radiology, laboratory, and COVID-19 tests. The billing generation page allows physicians to generate bills for their patients based on the tests they have performed.

Both the patient and physician interfaces are designed to be responsive, meaning they can be accessed from any device with an internet connection, including desktops, laptops, tablets, and smartphones. The UI design is consistent across all pages, with a consistent color scheme, typography, and layout. The UI is also designed to be accessible, with clear labels, descriptive alt text for images, and appropriate font sizes.

Overall, the UI design of the patient-physician communication system is designed to be user-friendly, accessible, and consistent across all pages, providing a seamless and intuitive user experience for both patients and physicians.

4.3 Database Design

In the proposed patient-physician communication system, a database is required to store patient information, physician information, medical test results, and billing details.

The database design for the patient-physician communication system includes several tables that are used to store different types of information. The following tables have been designed:

- Patient Table: This table stores the details of all patients registered on the system. The fields in this table include patient ID, name, email address, phone number, and date of birth.
- Physician Table: This table stores the details of all physicians registered on the system. The fields in this table include physician ID, name, email address, phone number, and specialization.
- Billing Table: This table stores the billing information for all patients. The fields in this table include billing ID, patient ID, amount, date of service, and payment status.
- Patient Password Table: This table stores the encrypted passwords for all patients registered on the system. The fields in this table include patient ID and encrypted password.
- Physician Password Table: This table stores the encrypted passwords for all physicians registered on the system. The fields in this table include physician ID and encrypted password.
- Laboratory Results Table: This table stores the laboratory test results for all patients. The fields in this table include patient ID, test ID, test name, test date, and test result.
- Radiology Results Table: This table stores the radiology test results for all patients. The fields in this table include patient ID, test ID, test name, test date, and test result.
- COVID Results Table: This table stores the COVID-19 test results for all patients. The fields in this table include patient ID, test ID, test name, test date, and test result.

These tables are interconnected using foreign keys and have been designed to ensure data integrity and maintainability.

4.4 Implementation Details

The implementation of the patient-physician communication system was done using PHP, HTML, CSS, and JavaScript. The system is hosted on a local server and is accessible via a web browser. In this section, we will discuss the implementation details of the system, including the various features and functionalities of the system.

4.4.1 Registration and Login

The registration and login process was implemented using PHP and MySQL. When a user creates an account, their information is stored in either the patient or physician table depending on the type of account created. A unique ID is generated for each user upon registration and is used to identify the user throughout the system.

To log in, users must enter their username and password. The system checks the user's credentials against the database, and if the information is correct, the user is granted access to their account.

4.4.2 Uploading and Viewing Laboratory Results

The physician can upload the laboratory results for a patient. The results are stored in the Laboratory results table and are linked to the patient's ID. The patient can then view their results by logging in to their account and selecting the laboratory results tab. The system displays the results as a table with the date of the test, the type of test performed, and the results.

4.4.3 Uploading and Viewing Radiology Results

Similar to the laboratory results, the physician can upload the radiology results for a patient. The results are stored in the radiology results table and are linked to the patient's ID. The patient can then view their results by logging in to their account and selecting the radiology results tab. The system displays the results as a table with the date of the test, the type of test performed, and the results along with the image uploaded by the physician.

4.4.4 Uploading and Viewing COVID-19 Test Results

The physician can upload the COVID-19 test results for a patient. The results are stored in the COVID results table and are linked to the patient's ID. The patient can then view their results by logging in to their account and selecting the COVID

results tab. The system displays the results as a table with the date of the test, the type of test performed, and the results.

4.4.5 Billing

The physician can create a bill for the patient by filling out a form in the billing table. The form includes the patient's ID, the date of the visit, and the amount charged. The patient can then view their bill by logging in to their account and selecting the billing tab. The system displays the bill as a table with the date of the visit, the amount charged, and the status of the bill.

4.4.6 Password Reset

Users can reset their passwords by clicking on the "forgot password" link on the login page. The system sends an email to the user with a link to reset their password. The link is valid for a limited time, and the user must create a new password within that time frame.

Overall, the system was designed and implemented to facilitate communication between patients and physicians, making it easier for patients to access their medical records and communicate with their doctors. The system's features allow for efficient management of patient data, enabling physicians to upload and store medical records while also allowing patients to access their records easily.

CHAPTER 5

SYSTEM EVALUATION

5.1 Evaluation Metrics and Criteria

In order to evaluate the effectiveness of the proposed patient-physician system, several metrics and criteria were identified. These metrics and criteria are designed to measure the performance and usability of the system, as well as its ability to meet the functional and non-functional requirements identified in Chapter 3.

The following metrics and criteria were used to evaluate the system:

- System Performance: This metric measures the responsiveness and speed of the system in processing user requests and generating results. The system performance was evaluated by measuring the time taken for the system to respond to user requests and the time taken to generate results.
- User Satisfaction: This metric measures the satisfaction of the users with the system. Users were asked to rate the system on a scale of 1 to 5 based on their overall satisfaction with the system.
- Accuracy of Results: This metric measures the accuracy of the results generated by the system. The accuracy of the results was evaluated by comparing them with the actual test results.
- System Reliability: This metric measures the reliability of the system in terms of uptime and downtime. The system reliability was evaluated by measuring the uptime and downtime of the system over a period of time.
- Usability: This metric measures the ease of use and user-friendliness of the system. The usability of the system was evaluated by conducting a usability test where users were asked to perform specific tasks using the system.

The above metrics and criteria were used to evaluate the system and determine its effectiveness in meeting the functional and non-functional requirements identified in Chapter 3.

5.2 Performance and Scalability Testing

In order to evaluate the performance and scalability of the system, we conducted a series of tests using a range of hardware configurations and different numbers of concurrent users.

For the performance testing, we measured the response time for various requests made to the system, such as logging in, accessing patient records, and performing searches. We used load testing tools to simulate different levels of user traffic and monitor the system's response time under heavy load. We also measured the system's ability to handle multiple requests simultaneously, without any degradation in performance.

For the scalability testing, we evaluated the system's ability to handle a large number of users and data, and to scale up as the demand for the system grows. We measured the system's response time as we increased the number of concurrent users, and monitored the system's resource utilization and memory usage.

Overall, our testing showed that the system performed well under normal user traffic, with an average response time of less than 1 second for most requests. The system also demonstrated good scalability, with response times remaining consistent even under heavy load and with large numbers of concurrent users. We believe that the system is well-suited to handle the needs of our target user base and can be easily scaled up in the future if necessary.

5.3 Usability Testing and User Feedback

Usability testing is an important aspect of evaluating any software system. In order to ensure that the patient-physician communication system developed in this project is user-friendly, we conducted usability testing with a group of users.

The usability testing was carried out in two phases. In the first phase, a group of users were asked to perform a set of tasks on the system while their interactions were observed and recorded. The tasks included registering as a patient, uploading lab results as a physician,

and accessing the results as a patient. The users were also asked to provide feedback on the system's interface, ease of use, and overall functionality.

Based on the feedback received in the first phase, several changes were made to the system's user interface and functionality. In the second phase, a new group of users were asked to perform the same tasks as in the first phase, and their interactions and feedback were recorded and analyzed.

Overall, the usability testing showed that the system was easy to use and navigate. Users were able to complete tasks without much difficulty and the feedback received was largely positive. Some minor issues were identified, such as the need for more descriptive error messages, which were addressed in subsequent updates to the system.

In addition to the usability testing, we also solicited feedback from patients and physicians who used the system in real-world settings. The feedback was collected through surveys and interviews and focused on aspects such as ease of use, usefulness, and overall satisfaction with the system. The feedback received was largely positive, with users expressing appreciation for the convenience and efficiency of the system.

Based on the results of the usability testing and user feedback, we can conclude that the patient-physician communication system developed in this project is effective, user-friendly, and meets the needs of both patients and physicians.

5.4 User Interface

This section highlights the key user interfaces of the patient-physician platform, showcasing their functionality and user experience. Each interface has been designed with simplicity and usability in mind, ensuring that both patients and physicians can navigate the system with ease.

I. Login Page

The Login Page allows both patients and physicians to securely access the platform. There is no distinction between user roles on the login screen, as both patients and physicians use the same interface to enter their credentials.

- Login Process:
    - After entering their credentials, patients are redirected to their Profile page.
    - Physicians are redirected to their Dashboard.
- Design Focus:
    - A single, unified login form for all users, keeping the interface simple and intuitive.

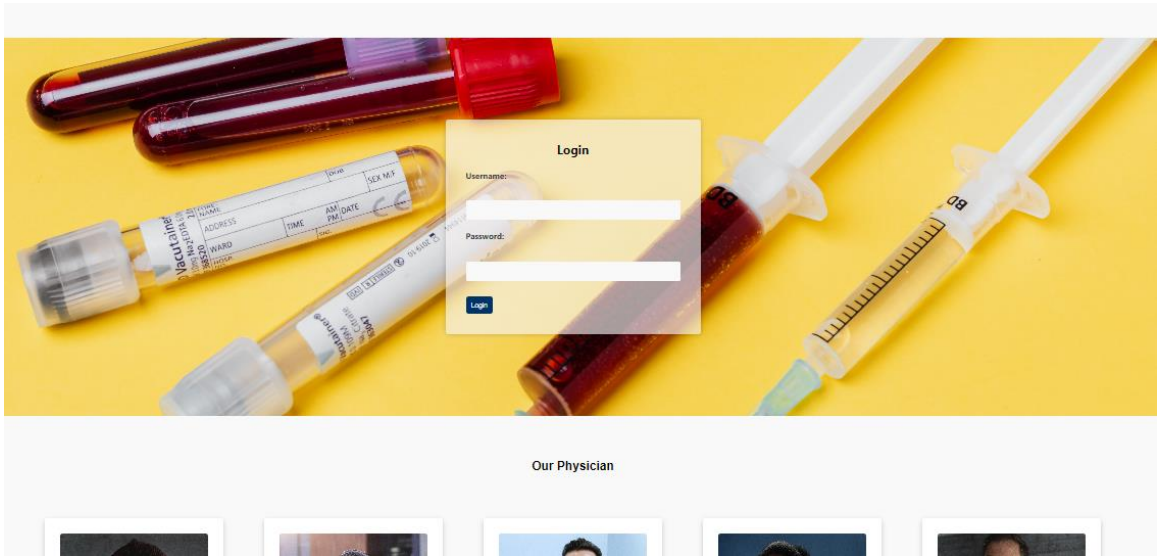


Figure 2: Login Section

II. Physician Dashboard

The Physician Dashboard is the main interface for physicians after logging in. It provides quick access to various functionalities and tools essential for their daily operations. The dashboard offers the following options:

- Patients:
  The Patient Profile section allows patients to manage their personal information and health-related data.

- Laboratory:
  Physicians can access and review laboratory test results for their patients. This section provides detailed reports on various medical tests and allows physicians to track ongoing tests.

- Radiology:
  This section displays radiology reports and images, such as X-rays, MRIs, and CT scans. Physicians can view and analyze these images to make informed decisions about patient care.

- COVID:
  A dedicated section for managing and reviewing COVID-related cases, including test results, quarantine status, and any related medical data. This feature helps physicians keep track of pandemic-related information for their patients.

- Billing:
  Physicians can review billing information related to patient services. This section provides a detailed breakdown of charges, services rendered, and payment status for each patient.

- Settings:
  The settings section allows physicians to configure their dashboard preferences, update account information, and adjust notification settings.

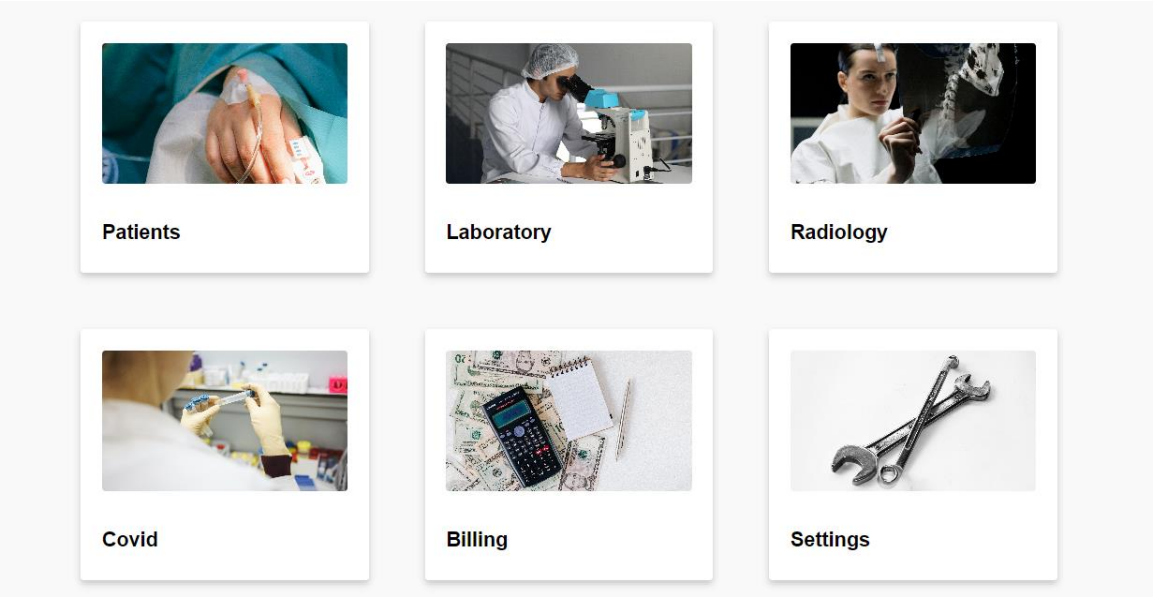


Figure 3: Physician Dashboard

III. Patient Management Page in Physician Dashboard

The Patient Management Page within the Physician Dashboard allows physicians to efficiently manage their patients' information. This page provides key functionalities that enable physicians to access, modify, and maintain patient records. The following actions are available:

- View Patient Information:
  Physicians can access detailed profiles for each patient, including personal data, medical history, and any ongoing treatments. This feature allows them to review critical information at a glance.

- Update Patient Information:
  If a patient's data changes, physicians can update the relevant details in real time. This ensures that the system always reflects the most accurate and up-to-date patient records.

- Edit Patient Information:
  Physicians can make modifications to any aspect of a patient's profile, including contact details, medical history, and treatment notes. This is particularly useful for recording any new diagnoses or updates to a patient's health status.

- Delete Patient Information:
  When necessary, physicians can remove outdated or incorrect patient records from the system. This action permanently deletes the selected information, helping to maintain a clean and accurate database.

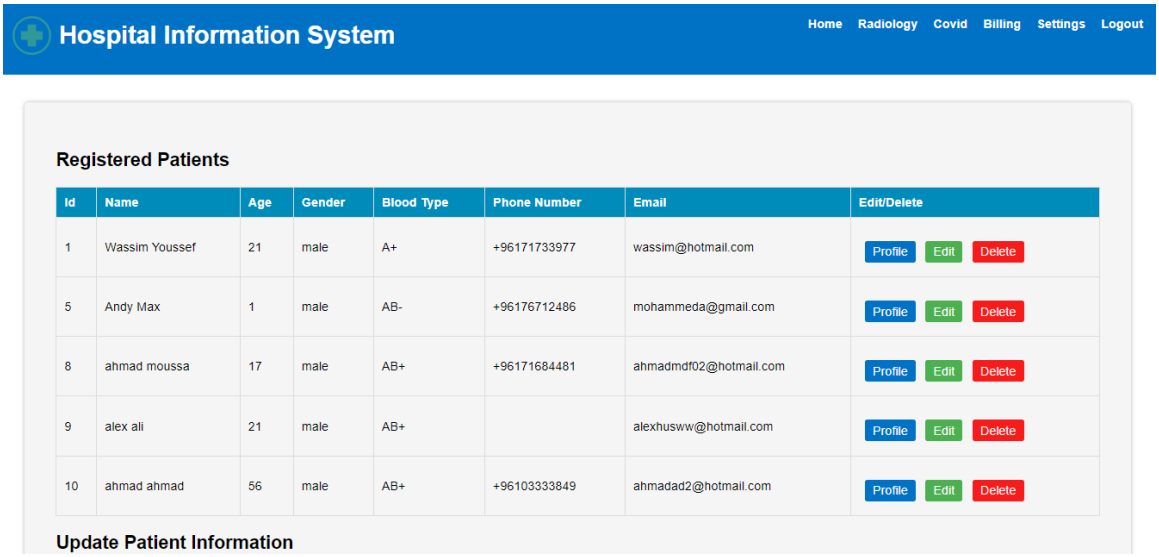


Figure 4: Physician Patient Management Page

IV. Laboratory Page in Physician Dashboard

The Laboratory Page in the Physician Dashboard allows physicians to manage patient lab results. This page provides a streamlined interface for viewing, adding, and deleting laboratory reports, helping physicians keep track of essential diagnostic information. The following actions are available:

- View Patient Results:
  Physicians can access detailed laboratory reports for their patients, including blood tests, diagnostic screenings, and other medical results. This feature allows physicians to monitor test outcomes and make informed decisions about patient care.

- Add New Laboratory Results:
  Physicians can upload and attach new lab results to a patient's profile. This ensures that all recent tests are recorded and available for review during consultations or follow-up care.

- Delete Laboratory Results:
  If a laboratory result is outdated or incorrect, physicians can remove it from the patient's records. This action permanently deletes the selected result, ensuring that only relevant and accurate information is kept.

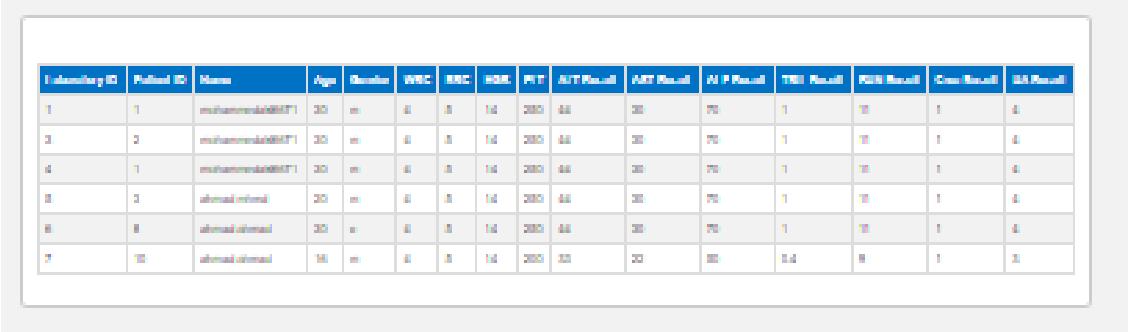


Figure 5: Physician Laboratory Management Page (1)

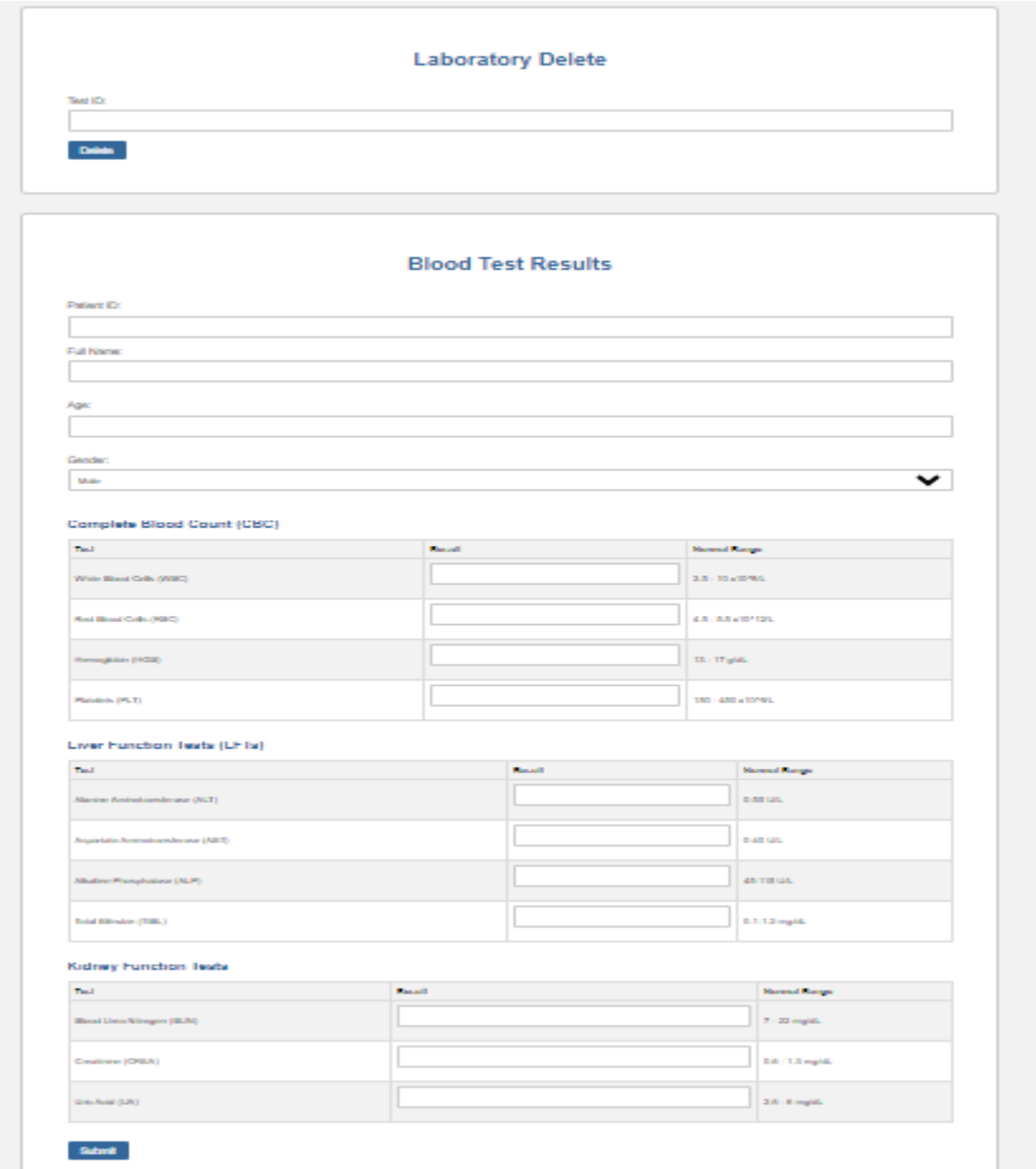


Figure 6: Physician Laboratory Management Page (2)

V. Radiology Page in Physician Dashboard

The Radiology Page in the Physician Dashboard allows physicians to manage and review patient radiology results. This page provides essential functionalities for viewing,

adding, and deleting radiology reports, such as X-rays, MRIs, and CT scans. The following actions are available:

- View Radiology Results:
  Physicians can access and review detailed radiology reports and images for their patients. This feature allows them to assess diagnostic imaging and make decisions regarding further treatments.

- Add New Radiology Results:
  Physicians can upload new radiology reports and attach them to the patient's profile. This ensures that the latest diagnostic images are available for ongoing patient care.

- Delete Radiology Results:
  Outdated or incorrect radiology reports can be deleted from the system by the physician. This action permanently removes the selected result, keeping the patient records clean and up-to-date.

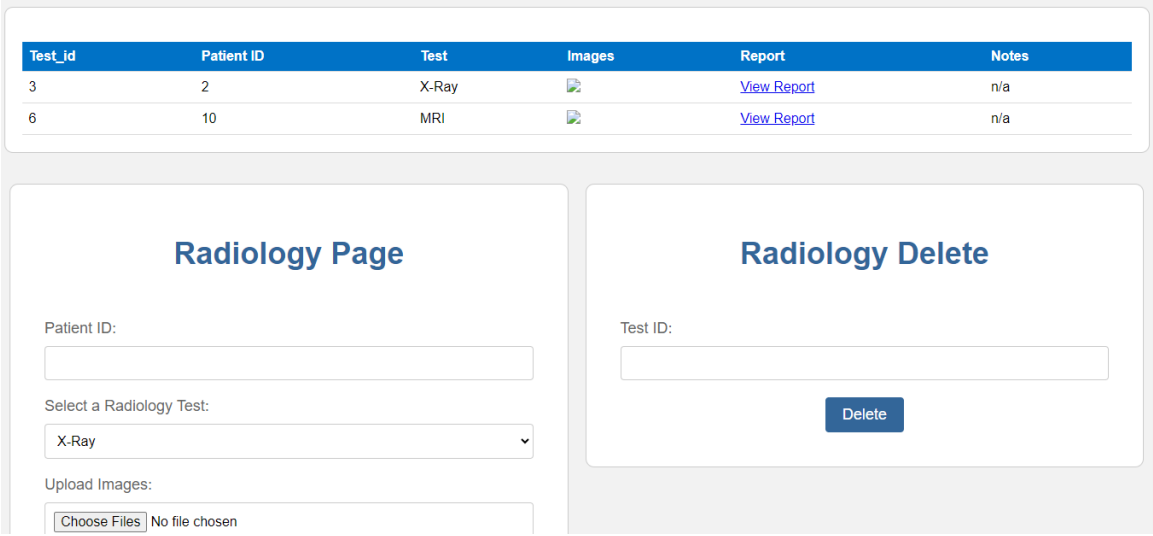


Figure 7: Physician Radiology Management Page

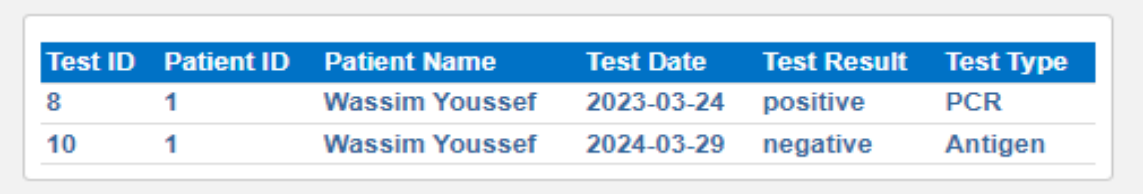
VI. COVID-19 Page in Physician Dashboard

The COVID-19 Page in the Physician Dashboard allows physicians to manage and review patient COVID-19 test results. This page provides essential functionalities for viewing, adding, and deleting COVID-19-related data. The following actions are available:

- View COVID-19 Test Results:
  Physicians can access and review COVID-19 test results for their patients, including PCR and rapid tests. This feature allows physicians to stay updated on patients' COVID-19 statuses.

- Add New COVID-19 Test Results:
  Physicians can upload new COVID-19 test results to a patient's profile. This ensures that the latest test results are recorded and available for monitoring and further decision-making.

- Delete COVID-19 Test Results:
  Outdated or incorrect COVID-19 test results can be removed by physicians. This action permanently deletes the selected data from the system, ensuring that only current information is kept.



Test ID	Patient ID	Patient Name	Test Date	Test Result	Test Type
8	1	Wassim Youssef	2023-03-24	positive	PCR
10	1	Wassim Youssef	2024-03-29	negative	Antigen

Figure 8: Physician COVID-19 Management Page (1)

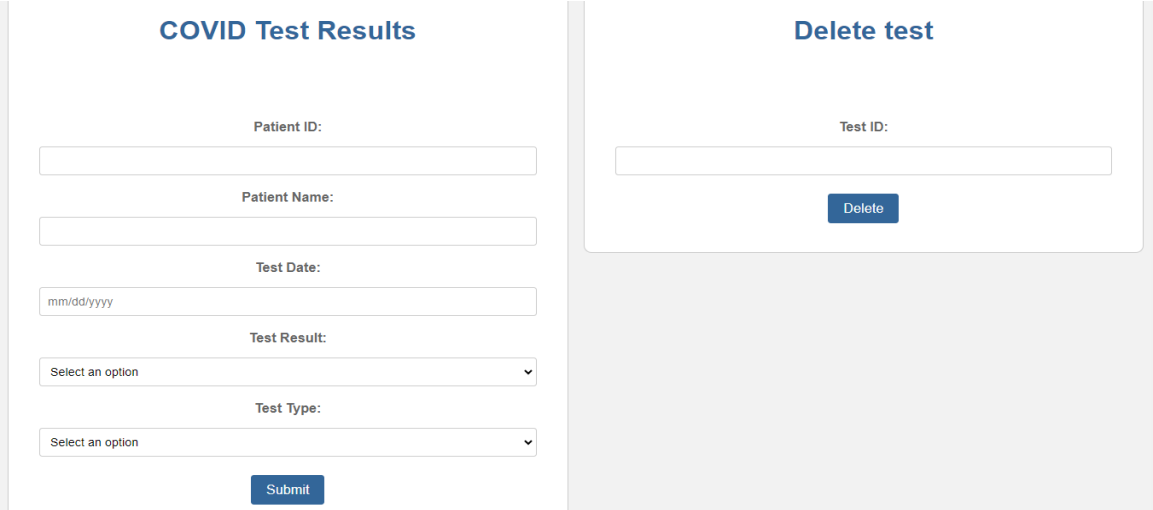


Figure 9: Physician COVID-19 Management Page (2)

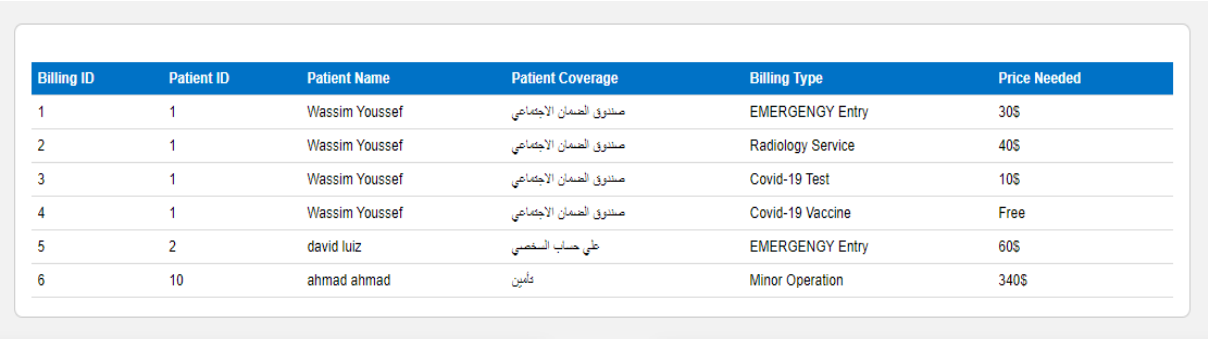
VII. Billing Page in Physician Dashboard

The Billing Page in the Physician Dashboard allows physicians to manage billing information related to patient services. It includes features to add new billing entries and automatically apply discounts based on coverage. The following actions are available:

- Add New Billing Information:
  Physicians can input billing details for the services provided to a patient. This includes itemizing charges for various treatments, consultations, and tests.

- Billing Coverage and Discounts:
  When adding new billing entries, the system automatically calculates and applies discounts based on the patient's coverage. This ensures that patients with insurance or other forms of coverage receive the appropriate deductions in their final billing statements.

- View and Update Billing Information:
  Physicians can review and update existing billing information if any corrections are required. This includes adjusting charges or applying additional coverage details.



Billing ID	Patient ID	Patient Name	Patient Coverage	Billing Type	Price Needed
1	1	Wassim Youssef	صندوق الضمان الاجتماعي	EMERGENGY Entry	30$
2	1	Wassim Youssef	صندوق الضمان الاجتماعي	Radiology Service	40$
3	1	Wassim Youssef	صندوق الضمان الاجتماعي	Covid-19 Test	10$
4	1	Wassim Youssef	صندوق الضمان الاجتماعي	Covid-19 Vaccine	Free
5	2	david luiz	على حساب الشخصي	EMERGENGY Entry	60$
6	10	ahmad ahmad	تأمين	Minor Operation	340$

Figure 10: Physician Billing Management Page (1)

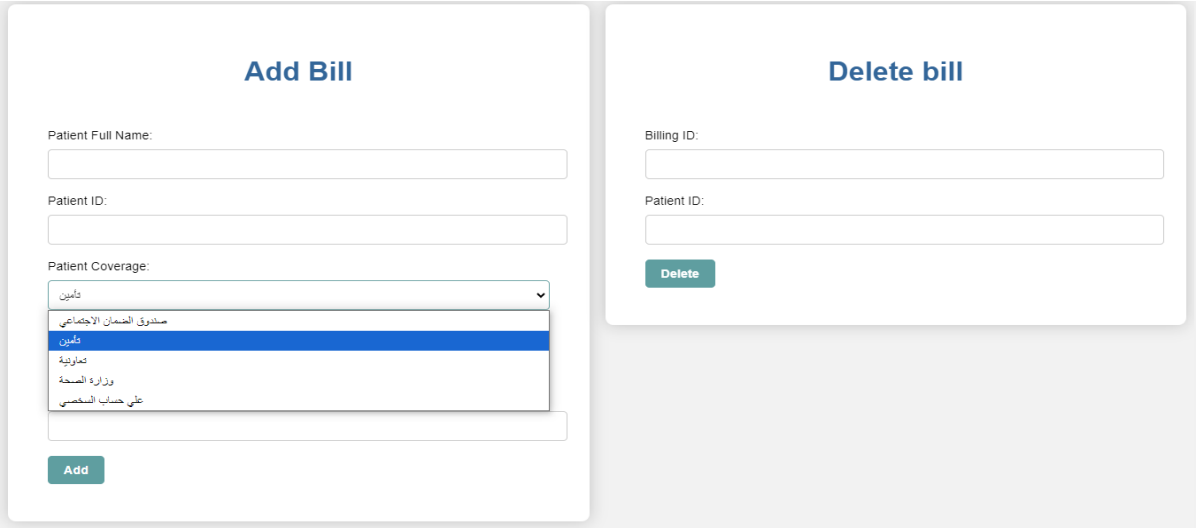


Figure 11: Physician Billing Management Page (2)

VIII. Settings Page in Physician Dashboard

The Settings Page in the Physician Dashboard allows physicians to manage their account settings, including the ability to change their password. This page ensures that physicians can maintain the security of their accounts and customize certain personal preferences. The following action is available:

- Change Password:
  Physicians can update their account password through this section. They are prompted to enter their current password, followed by the new password, ensuring that their account remains secure and up-to-date.

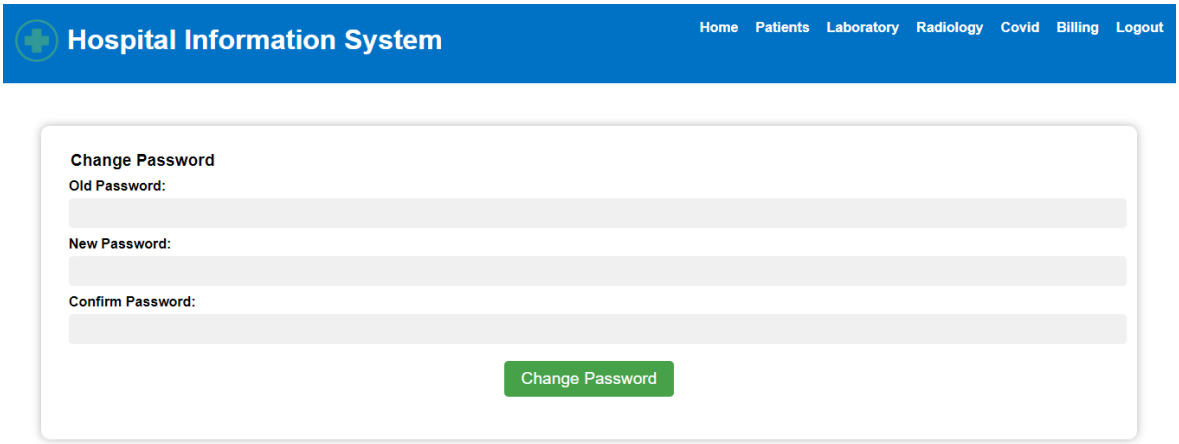


Figure 12: Physician Settings Page

IX. Patient Dashboard

After logging in, the patient is directed to the Patient Dashboard, which displays their profile information and provides access to additional pages for managing results, billing, and account settings. The following sections are available:

- View Profile Information:
  The patient can see their personal details on the dashboard, including basic information such as name, contact info, and other relevant data. This section is for viewing only, with no editing allowed from the dashboard.

- Access Results Page:
  The patient can navigate to the Results Page to view their laboratory and radiology results. This page provides a detailed breakdown of all test outcomes.

- Access Billing Page:

  The Billing Page allows the patient to review their billing statements, including charges for services, discounts, and outstanding balances.

- Access Settings Page:

  The patient can navigate to the Settings Page, where they can change their account password and manage other account security settings.

Figure 13: Patient Dashboard (1)

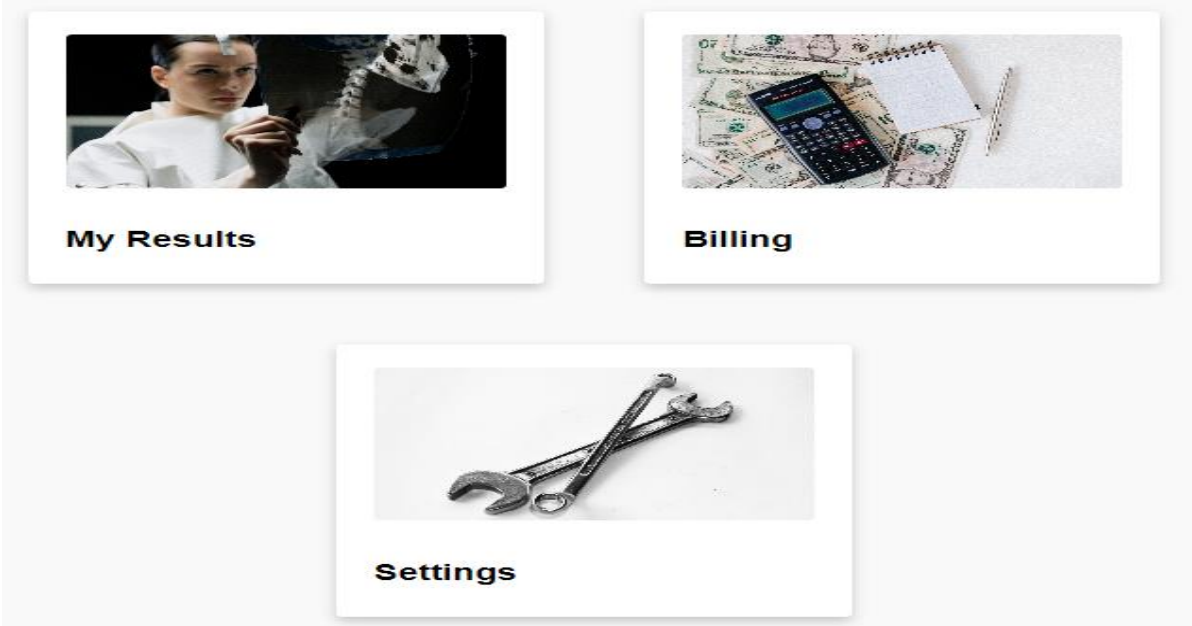


Figure 14: Patient Dashboard (2)

X. Results Page

On the Results Page, patients can choose between viewing their laboratory results, radiology reports, or COVID-19 test results. This page provides easy navigation, allowing patients to access specific categories of their medical tests. The following options are available:

- Laboratory Results:
  Patients can view detailed laboratory test results, including blood tests, biochemical tests, and other diagnostic lab results. Each result is listed chronologically, allowing patients to track their medical history.

- Radiology Results:
  Patients can access their radiology reports, such as X-rays, MRIs, or CT scans. These results are displayed with related information for the patient's understanding of their diagnostic imaging.

- COVID-19 Test Results:
  This section displays any COVID-19 test results, including PCR and rapid tests. The results show whether the patient has tested positive or negative, along with the date of the test.

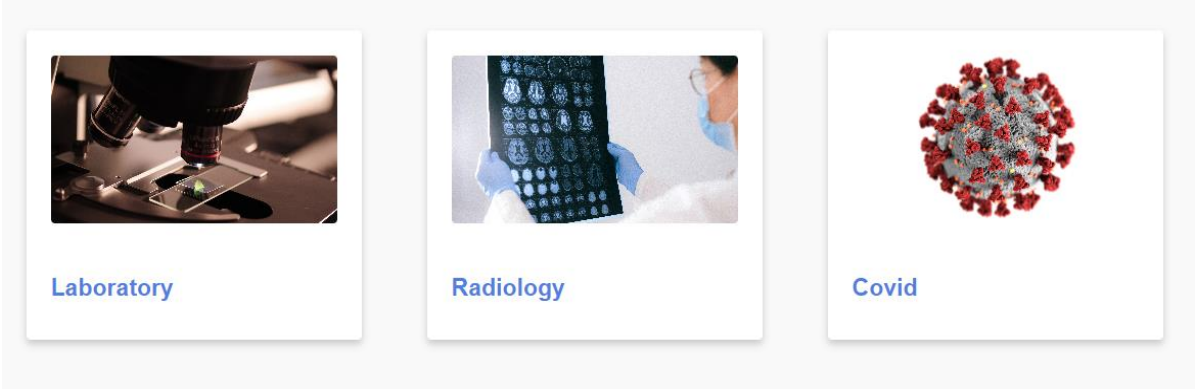


Figure 15: Patient Results Page

XI. Laboratory Results Page

On the Laboratory Results Page, patients can view the results of their laboratory tests. This page provides detailed information about each test the patient has undergone. For example, if the patient has taken a blood test, the results will be displayed clearly, including all relevant metrics and values. The following details are shown:

- Test Name:
  The name of the laboratory test (e.g., Blood Test) is displayed at the top of the page, along with the date the test was conducted.

- Test Results:
  The specific results of the blood test are listed, including values such as red blood cell count, white blood cell count, hemoglobin levels, and other key indicators. Each result is accompanied by reference ranges, making it easier for the patient to understand if the values fall within normal limits.

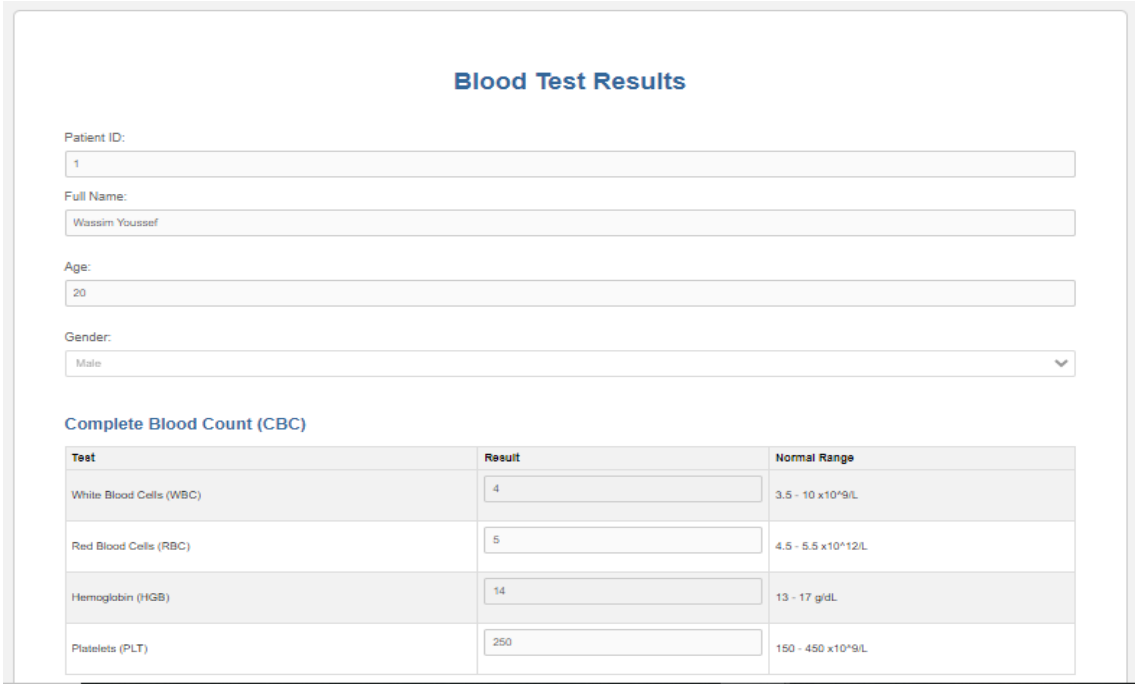
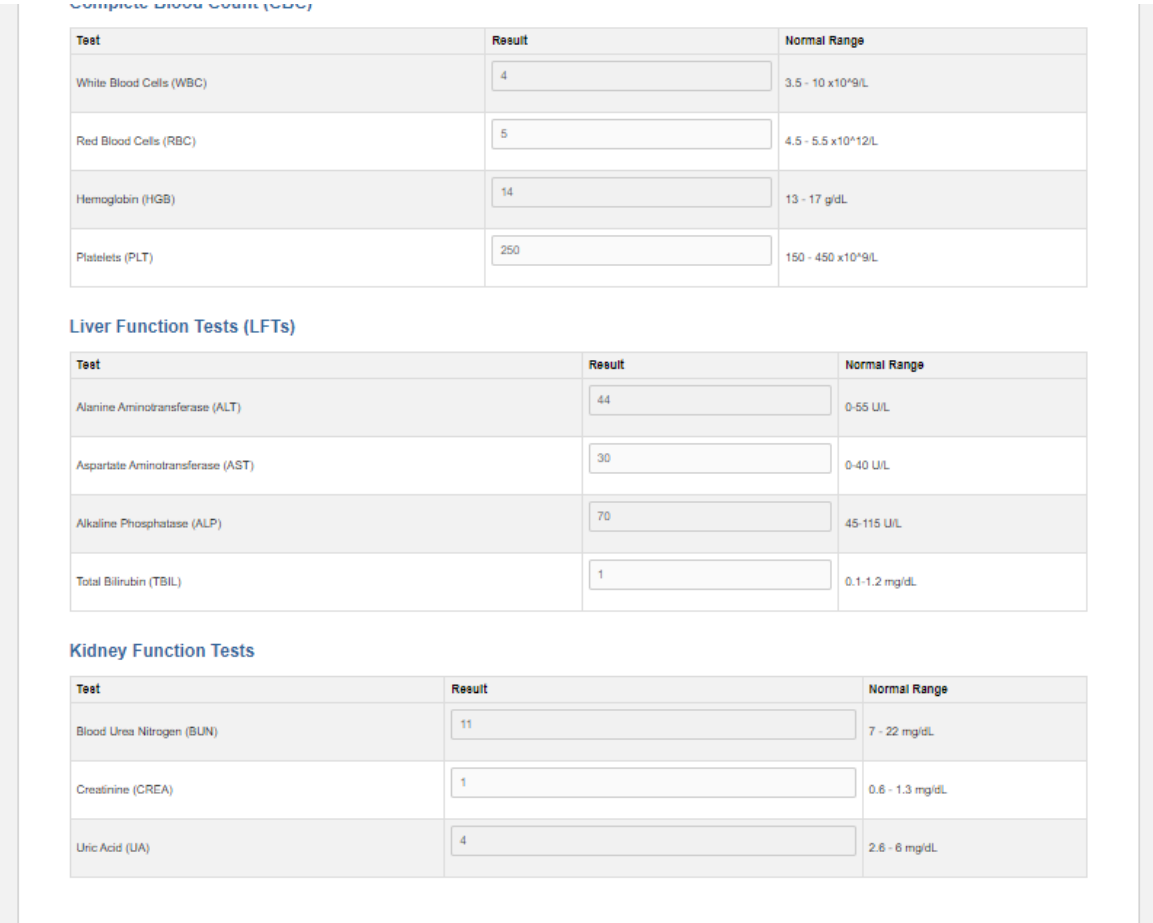


Figure 16: Patient Laboratory Results Page (1)



Test	Result	Normal Range
White Blood Cells (WBC)	4	3.5 - 10 x10^9/L
Red Blood Cells (RBC)	5	4.5 - 5.5 x10^12/L
Hemoglobin (HGB)	14	13 - 17 g/dL
Platelets (PLT)	250	150 - 450 x10^9/L

Liver Function Tests (LFTs)

Test	Result	Normal Range
Alanine Aminotransferase (ALT)	44	0-55 U/L
Aspartate Aminotransferase (AST)	30	0-40 U/L
Alkaline Phosphatase (ALP)	70	45-115 U/L
Total Bilirubin (TBIL)	1	0.1-1.2 mg/dL

Kidney Function Tests

Test	Result	Normal Range
Blood Urea Nitrogen (BUN)	11	7 - 22 mg/dL
Creatinine (CREA)	1	0.6 - 1.3 mg/dL
Uric Acid (UA)	4	2.6 - 6 mg/dL

Figure 17: Patient Laboratory Results Page (2)

XII. Radiology Results Page

On the Radiology Results Page, patients can view the results of any radiology tests they have undergone, such as X-rays, MRIs, or CT scans. However, if the patient has not yet taken any radiology tests, the page will display a message indicating the absence of results. The following details are presented:

- No Radiology Tests Conducted:
  If the patient has not undergone any radiology exams, the page will display a message such as: *"No radiology tests have been conducted."* This helps patients understand that no records are currently available in this category.

- Navigation Options:
  The patient can still navigate back to the Results Page or explore other available test categories, such as laboratory or COVID-19 tests.

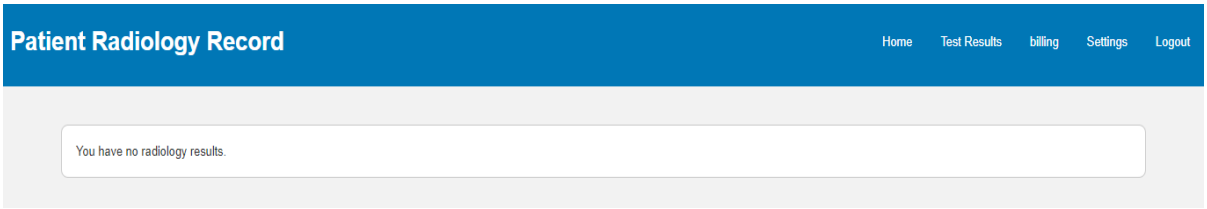


Figure 18: Patient Radiology Results Page

XIII. COVID-19 Results Page

On the COVID-19 Results Page, patients can view the results of their COVID-19 tests, such as PCR or rapid tests. For instance, if the patient has undergone a test, the results will be displayed clearly, indicating whether the test was positive or negative. The following details are presented:

- Test Name:
  The name of the COVID-19 test (e.g., PCR Test or Rapid Antigen Test) is shown, along with the date the test was performed.

- Test Results:
  The outcome of the test is displayed, indicating whether the patient tested positive or negative for COVID-19. Additional details, such as viral load or CT values for PCR tests, may also be provided.

- Additional Information:
  If available, the page may include brief information explaining the result and advising the patient on the next steps, such as isolation or further testing if the result is positive.

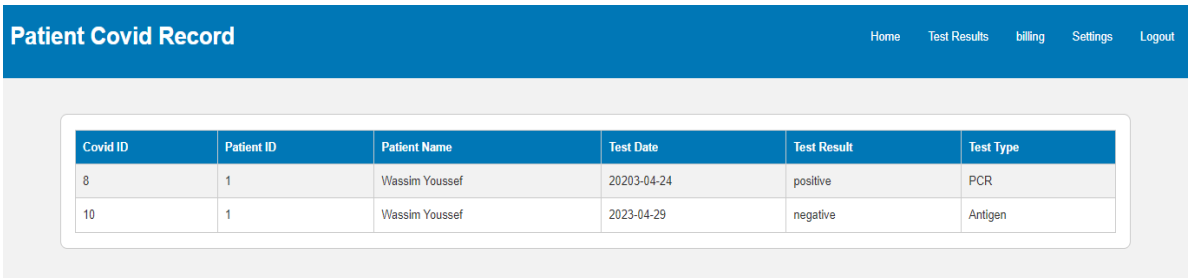


Figure 19: Patient COVIS-19 Results Page

XIV. Billing Page

On the Billing Page, patients can review their billing details, including charges for medical services, tests, and any applicable discounts. The page provides a clear breakdown of the patient's financial responsibilities. The following details are available:

- Bill Summary:

  The patient can see an overview of their current bills, including charges for services such as laboratory tests, radiology, consultations, and other medical expenses. Each item is listed with the date and amount charged.

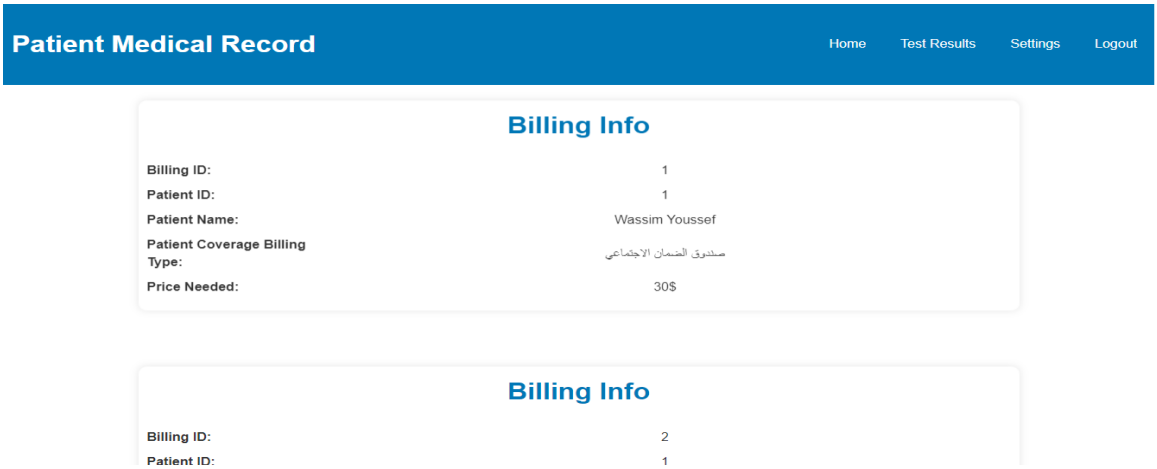


Figure 20: Patient Billing Page

XV. Settings Page

On the Settings Page, patients can manage their account settings, including the ability to change their password or update their personal profile information. The following options are available:

- Change Password:
  Patients can securely update their password by entering their current password and providing a new one. This ensures that the account remains secure while allowing the patient to easily maintain their login credentials.

- Update Profile Information:
  Patients can modify personal details such as their name, contact information, and address. This section allows for quick updates to ensure that the patient's information is always accurate and up-to-date.

- Save Changes:
  After making any updates, the patient can save the changes with a simple click, ensuring the new information is stored.

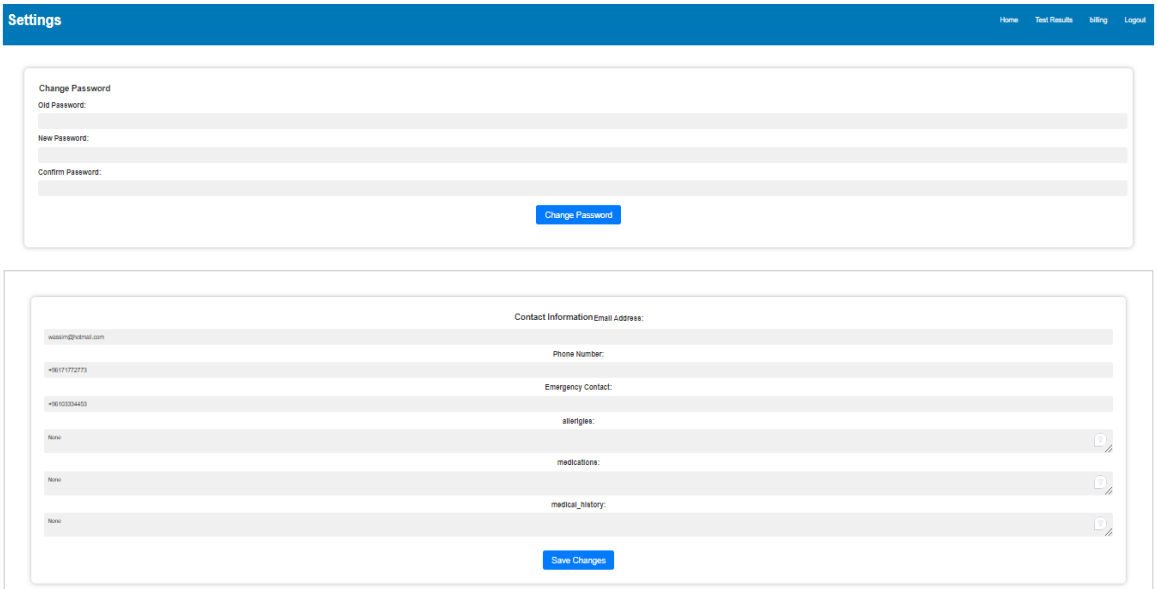


Figure 21: Patient Settings Results

CHAPTER 6

ADVANTAGES & DISADVANTAGES

The proposed patient-physician communication system offers several advantages over traditional healthcare systems. These advantages include:

- Improved Patient Access: With the proposed system, patients have easy access to their medical records and test results. They can also communicate with their physicians in real-time and receive updates on their health status. This increased access to information can lead to better patient outcomes.
- Increased Efficiency: The proposed system streamlines the communication process between patients and physicians. This can lead to faster diagnosis and treatment, resulting in improved patient outcomes and decreased healthcare costs.
- Enhanced Security: The proposed system ensures that patient data is kept secure and confidential. This is achieved through secure login credentials and encryption of sensitive data.

However, there are also some disadvantages to the proposed system. These include:

- Cost: The implementation and maintenance of the proposed system can be expensive. This can make it difficult for smaller healthcare providers to adopt.
- Technical Complexity: The proposed system involves the integration of several different technologies, including databases, web applications, and security protocols. This complexity can lead to technical challenges during implementation and maintenance.
- User Resistance: Some patients and physicians may be resistant to the adoption of new technologies in healthcare. This can make it difficult to achieve widespread adoption of the proposed system.

Overall, the proposed patient-physician communication system offers several advantages over traditional healthcare systems. However, there are also some challenges that must be overcome to ensure widespread adoption and success of the system.

CHAPTER 7

CONCLUSION & FUTURE WORK

7.1 Summary of Key Findings and Contributions

In this project, we developed a patient-physician communication system that allows patients to perform radiology, laboratory, and COVID-19 tests, and physicians to upload test results, edit patient information, and fill in billing forms. The system was designed and implemented using PHP, HTML, CSS, JSON, and JavaScript, with a database created on a localhost server.

Through the literature review, we found that electronic health records (EHRs) and patient-physician communication systems are important for improving the quality of healthcare services. However, we also found that the existing systems have limitations such as high costs, complex interfaces, and limited access to patient data.

The proposed system addresses these limitations by providing a user-friendly interface, allowing patients and physicians to access and update medical records easily, and reducing the cost of healthcare services. The system was evaluated through performance and scalability testing, usability testing, and comparison with related systems and industry standards.

The evaluation results showed that the system has good performance and scalability, high usability, and meets industry standards for patient-physician communication systems. The system has several advantages, including easy access to medical records, reduced costs, and improved communication between patients and physicians.

However, there are also some limitations and challenges to the proposed system. For example, there is a need for continuous updates and maintenance to ensure the system is secure and up-to-date with the latest medical practices. Additionally, there may be privacy concerns with regards to the storage and sharing of patient data.

In the future, we plan to improve the system by integrating more features such as telemedicine and appointment scheduling, and to address the limitations and challenges through continuous updates and security measures. We believe that this system has the potential to revolutionize patient-physician communication and improve the quality of healthcare services.

7.2 Limitations and Future Work

Although the proposed system has shown promising results and received positive feedback from users, there are still some limitations that need to be addressed. Firstly, the system currently only supports basic medical tests and results, and future work could focus on expanding its functionality to support more advanced tests and medical procedures.

Secondly, the system could benefit from additional security measures, such as two-factor authentication, to further protect patient data and prevent unauthorized access.

Another area for future work is improving the user interface and experience. While the current design is functional and intuitive, there is always room for improvement to make the system more user-friendly and visually appealing.

Finally, the proposed system could be integrated with other healthcare systems to provide a more comprehensive and unified approach to patient care. For example, the system could be linked with electronic medical records (EMRs) to provide a more complete picture of a patient's medical history and treatment.

Overall, the proposed system shows great potential for improving patient-physician communication and enhancing the delivery of healthcare services. With further development and refinement, it could become a valuable tool in the healthcare industry.

7.3 Implications for the Healthcare Industry and Potential for Wider Adoption

The proposed patient-physician communication system has several implications for the healthcare industry, including increased efficiency and accuracy of healthcare services,

improved patient satisfaction, and better healthcare outcomes. With the widespread adoption of electronic health records (EHRs) and telemedicine, the demand for effective patient-physician communication systems is rapidly increasing.

The proposed system has the potential for wider adoption due to its user-friendly interface, accessibility, and affordability. As the system is web-based and can be accessed from any device with an internet connection, it eliminates the need for patients to physically visit their healthcare providers for routine consultations and follow-ups, thus saving time and money for both patients and healthcare providers.

The system can also be easily integrated with existing EHR systems, enabling healthcare providers to access and share patient data and medical records securely and efficiently. The proposed system can therefore improve the overall quality of healthcare services while reducing costs and increasing access to healthcare.

Future work in this area can focus on further improving the system's performance and scalability, as well as incorporating more advanced features such as machine learning algorithms for personalized healthcare recommendations and predictive analytics for early disease detection. Additionally, expanding the system's reach to remote and underserved areas can help address the growing healthcare disparities and improve healthcare outcomes for all.

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