

**ARCHITECTURE OF DATABASE
MANAGEMENT SYSTEM
PATIENT MEDICAL RECORD DISPATCH
FALL - 2016**

Submitted by

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ABSTRACT

The requirement of health care systems to develop centres of clinical excellence has increased the dependence on the medical transport to move the patients or the records/reports of the patients which is a time sensitive issue. This is dependent on the efficiency of the transport services. In order to enhance the efficiency of the record maintenance, use of EMR (Electronic Medical Record) has been started which is, however, limited to the outcomes analysis. The need of development of a fully integrated and automated medical system is highly required to enhance the efficiency in the medical field.

In this paper, we describe the elements necessary to develop a fully integrated medical transport EMR, the current limitations and challenges and present the future scope in developing the support tools for the patients requiring transport.

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1. INTRODUCTION

Introduction to the Topic

In a very general scenario, in hospitals, the doctors order the medical tests for the patients. These orders go to the testing lab and the results are sent back to the doctors. This is highly manually intensive in the current situation. Generally, the staffs take the orders, take them to right labs for testing and carry the results back to the right doctors for consultation. This entire process can be automated by the development of fully integrated medical system.

Health care systems are increasingly developing centres of excellence which provide the ability to deliver highly specialized care while improving the outcomes. These centres mostly are located at the urban areas, often limiting access to the timely care of the patients residing in the remote areas, especially for time sensitive conditions. Several studies provide evidence of positive outcomes for the transfer of patients who experience time sensitive emergencies. Contradicting these studies, others have reported that some patients have experienced worst outcomes. Therefore, the purpose of this project is to merge the electronic data sources for the patients to create a fully integrated medical record to support comparative effectiveness research (CER) efforts.

Existing System

Physicians are expected to document the encounters they have with the patients to ensure that the crucial information for decision making is recorded and appropriate actions are taken. This documentation is mostly ignored as it distracts the main intention of the doctors, i.e., taking care of the patients. To ensure that the records don't go unrecorded, the idea of recording the patient's information electronically instead of on paper has been introduced. This maintenance of electronic records is called as Electronic Medical Record (EMR). Although the EMR was introduced and developed decades ago (around 1972), the substantial use has increased from 1998.

The use of EMR has undoubtedly decreased the requirement of manual documentation of the patient records, but could not completely provide an automated

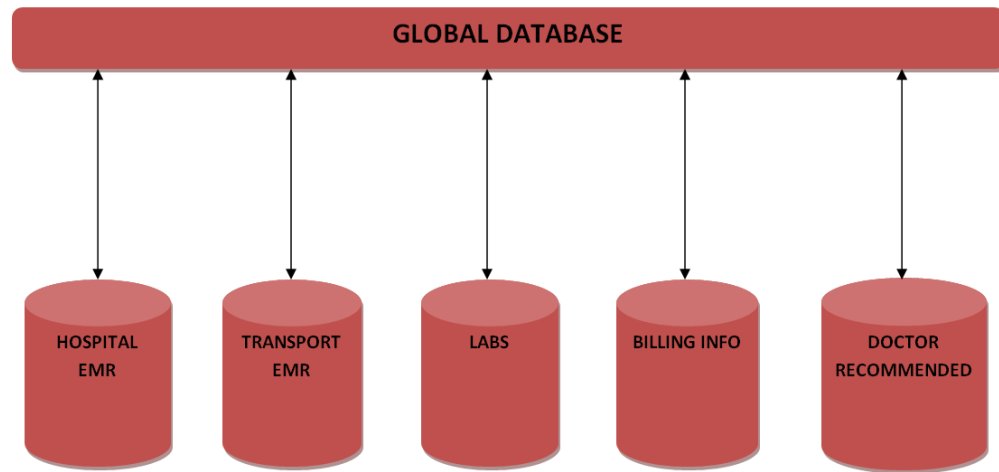
medical system that even reduces the human intervention in making an appointment, ordering for lab tests, collecting the results from the labs, etc.

To overcome the limitations of EMR, we propose this system that further reduces the human intervention in maintaining the medical records.

Proposed System

The primary challenge is the interoperability of the transport EMR with the hospital EMR. Recent research efforts focus on leveraging the large amounts of data that is available to conduct CER. Combining these multiple data sources to enable CER can be accomplished via a fully integrated medical system. Development of a fully integrated medical system will provide the ability to address the complex questions related to patient's outcomes which can provide valid conclusions in a timely manner. The fully integrated EMR is SQL based and is stored on a global server.

2. FULLY INTEGRATED EMR



Fully Integrated EMR

From the figure, it is clear that the data is bidirectional from the database and the corresponding sources of data. Right from the initial hospital admission through transport to appointment and consultation with the recommended doctor, all the data is incorporated through the patient's entire episode of care.

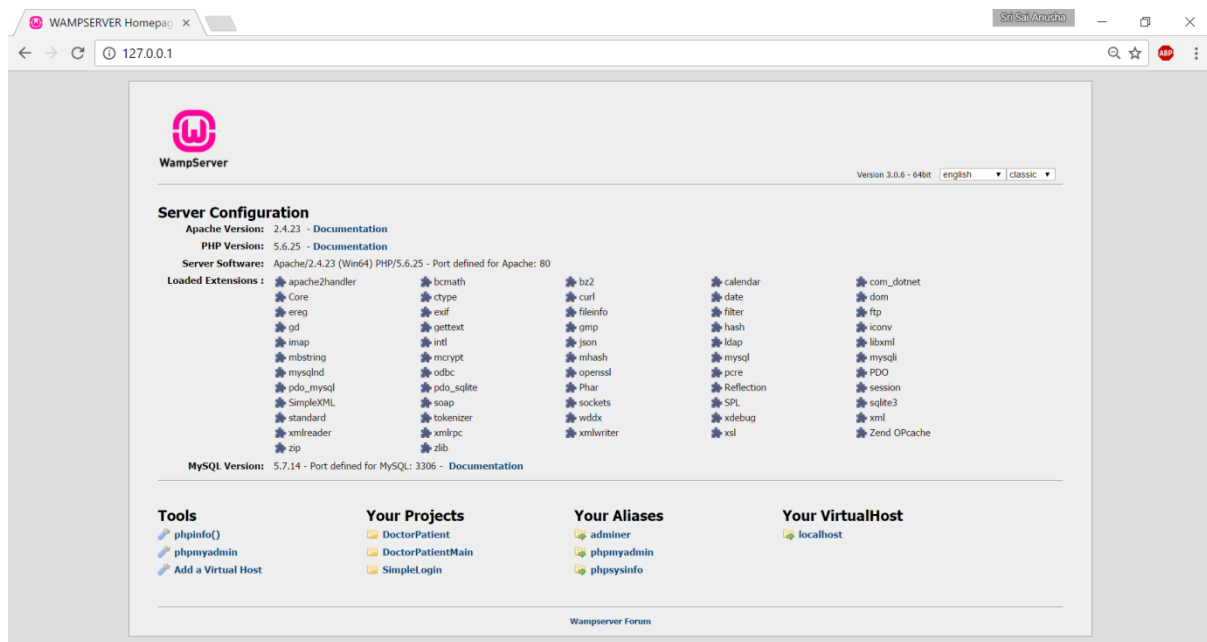
Here, Hospital EMR stores the records of the patients from their initial admission; Transport EMR stores the records of the patients which were sent to the other recommended doctors; Lab records contain the information regarding the patients that need to take the tests and the results of the tests taken; Billing information records contain the information regarding the payments made and which are due by the patients and Doctor recommended records contain the information of the patients that have been sent to a particular doctor for consultation.

In the past, retrieving the information from these sources was very time consuming as the records maintained were physical and on paper. But recent studies and works has made the record maintenance electronic that it takes just moments to create a record or obtain the record of any patient.

3. MODEL WE HAVE WORKED ON

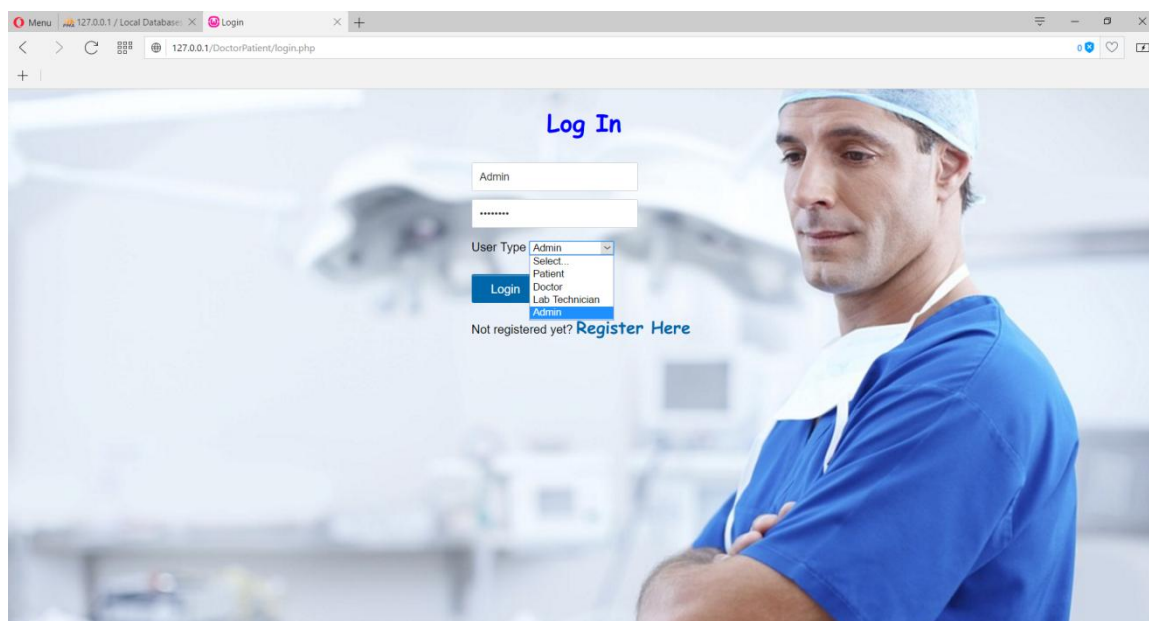
Data Management

The data in this project is created using **php** using **wampserver**. Individual data sources are maintained and stored in the database. This model record is locked and allows inquiries only from registered users.

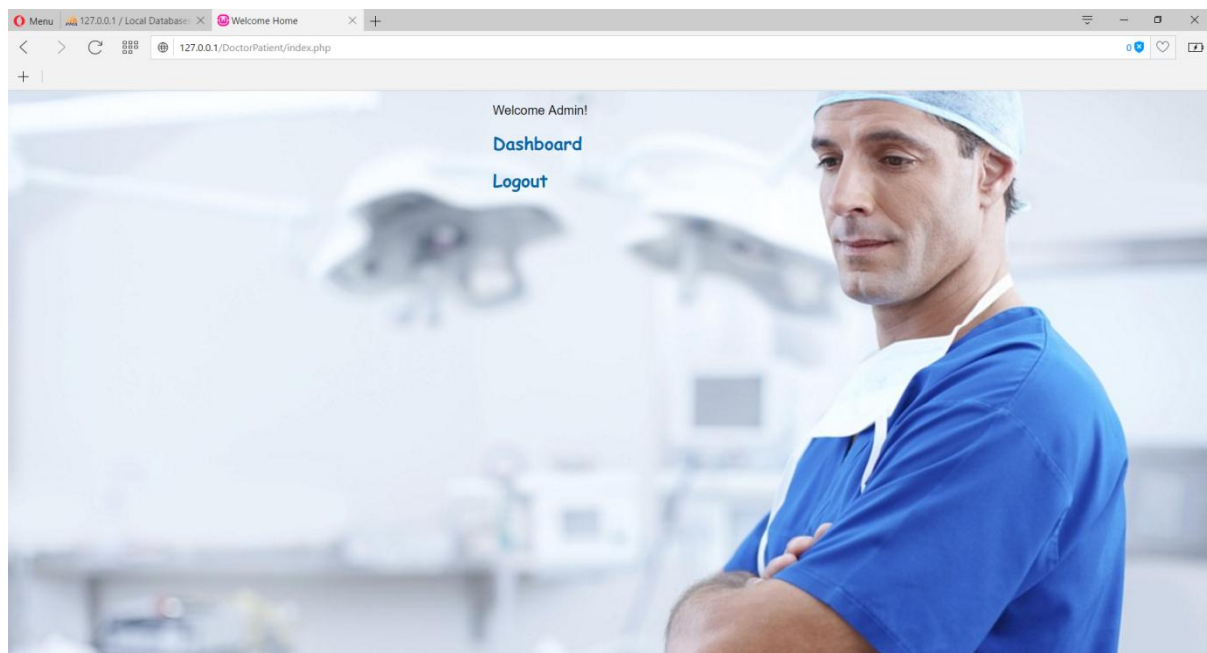


Login Page – Admin

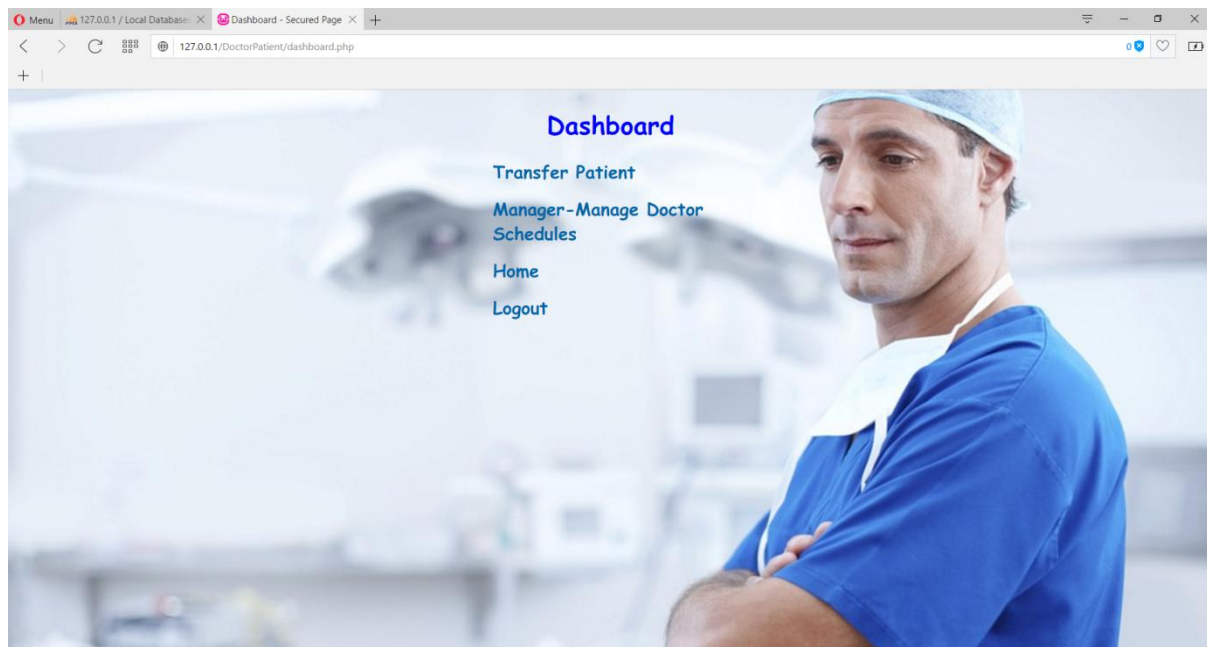
Admin doesn't need any registration as he is the one who will be creating and managing the page/website.



Welcome Page - Admin



Dashboard - Admin



Patient Details

The screenshot shows a web browser window with the URL `127.0.0.1/DoctorPatient/transferpatient.php`. The page title is "Patient Details". It contains a table with the following data:

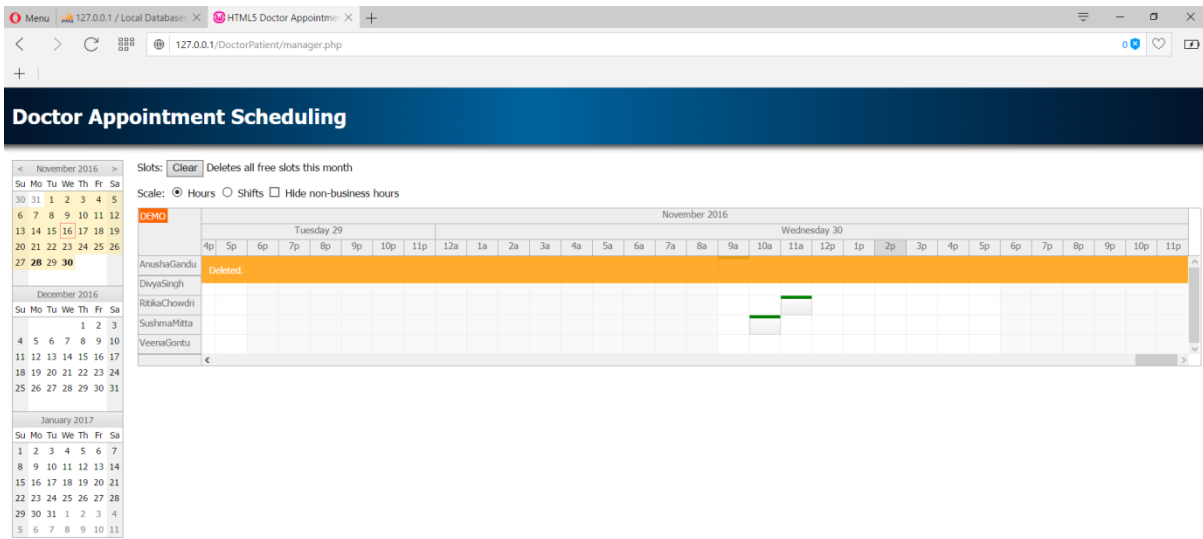
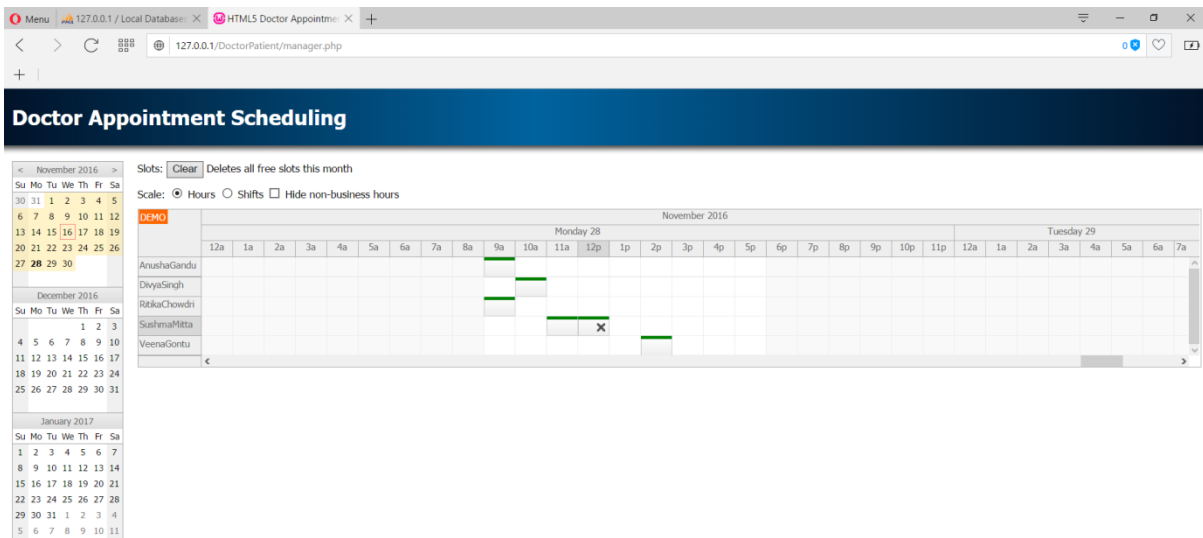
Patient Name	Patient Since	Delete	Transfer
Sunil Kumar	2016-11-16	<button>Delete</button>	<button>Transfer</button>

Below the table is a link: [Back to home](#).

Managing Doctor Schedules

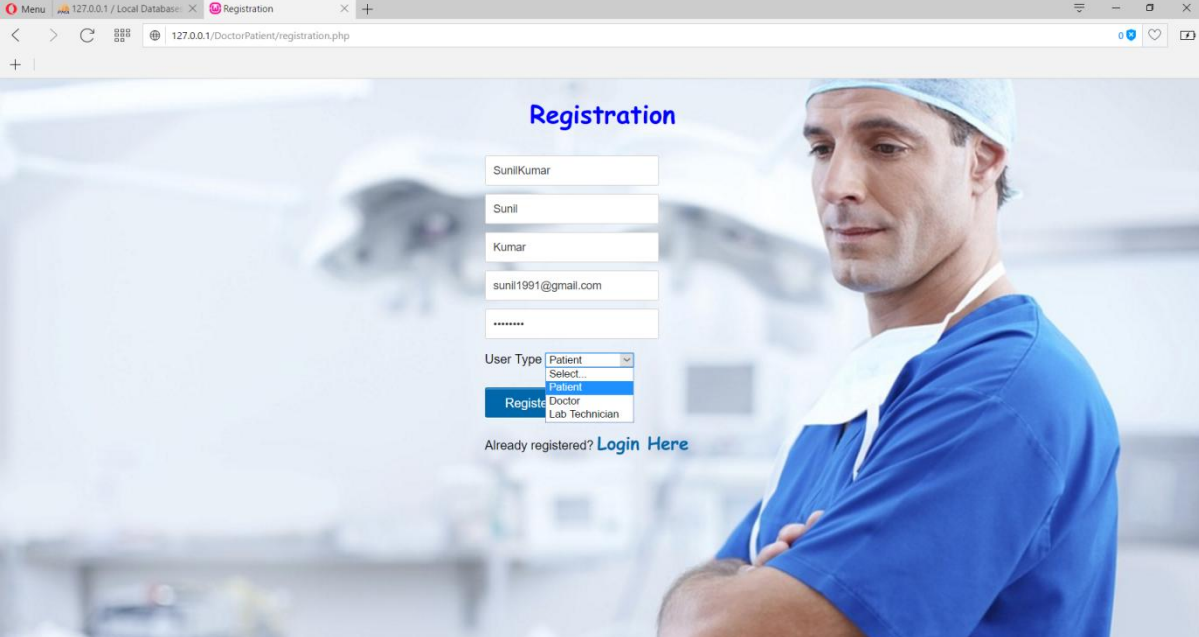
The screenshot shows a web browser window with the URL `127.0.0.1/DoctorPatient/manager.php`. The page title is "Doctor Appointment Scheduling". It features a calendar interface for November 2016. The "Slots" section has a "Clear" button and the text "Deletes all free slots this month". The "Scale" section has radio buttons for "Hours" (selected) and "Shifts", and a checkbox for "Hide non-business hours". The "DEMO" section shows a grid of slots for Monday 28 and Tuesday 29. The grid is currently empty, indicating that all slots have been cleared.

The screenshot shows the same web browser window as the previous one, but with the "Shifts created" state. The "Slots" section still has the "Clear" button. The "Scale" section has the "Hours" radio button selected. The "DEMO" section shows a grid of slots for Monday 28 and Tuesday 29. The grid now contains orange bars representing shifts created for the doctors listed on the left: AnushaGandhu, DivyaSingh, RitikaChowdri, SushmaMitta, and VeenaGontu.



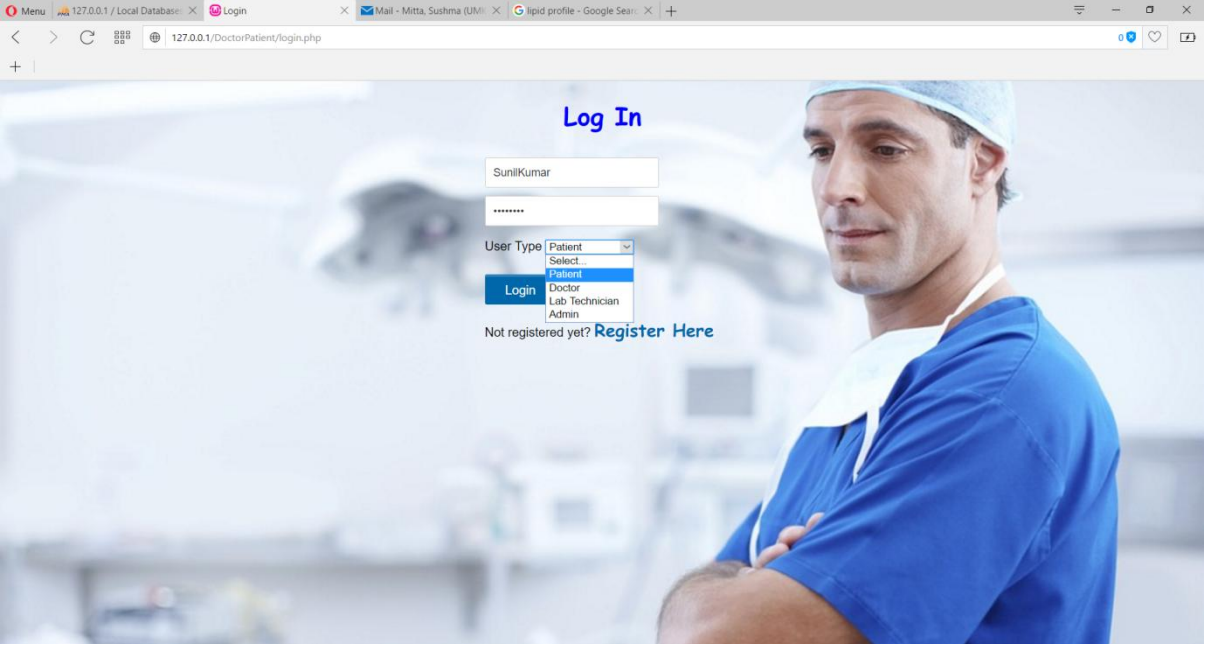
Registration Page – Patient

A patient can login only if he/she is registered previously.



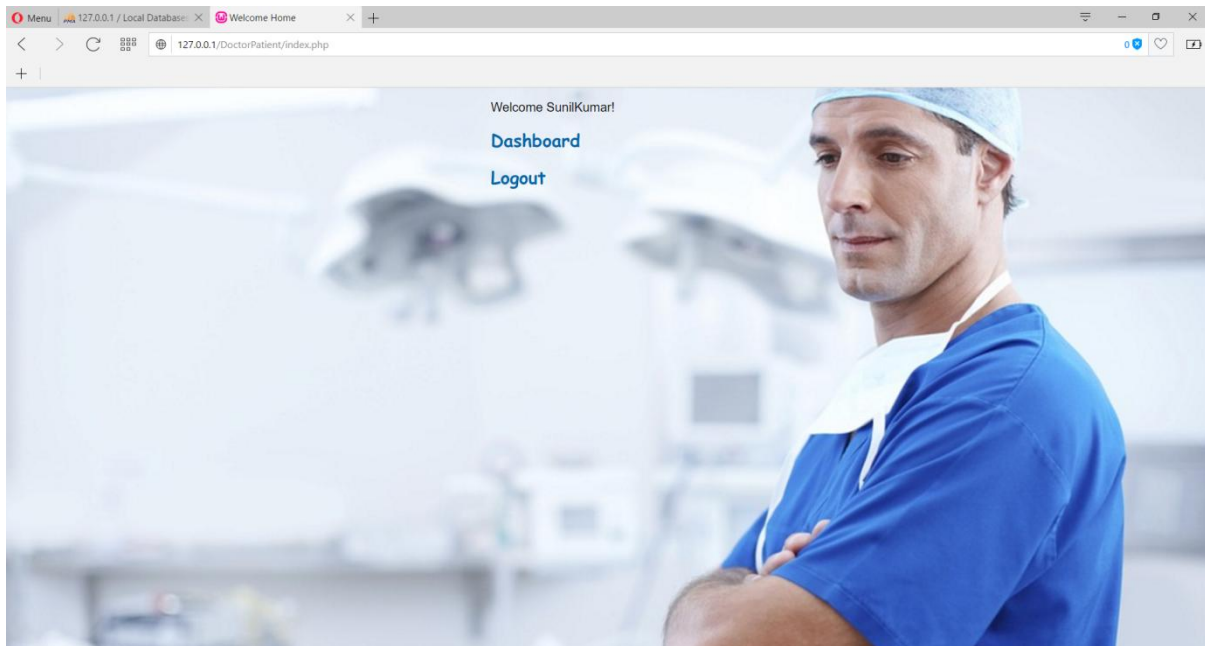
The screenshot shows a web browser window with the URL `127.0.0.1/DoctorPatient/registration.php`. The page is titled "Registration" in blue text. It features a registration form with the following fields: a text input for the full name (containing "SunilKumar"), a text input for the first name (containing "Sunil"), a text input for the last name (containing "Kumar"), a text input for the email address (containing "sunil1991@gmail.com"), and a password input field (containing "*****"). Below these fields is a "User Type" dropdown menu with options: "Patient" (selected), "Select...", "Doctor", and "Lab Technician". A blue "Register" button is positioned below the dropdown. At the bottom of the form, there is a link that says "Already registered? [Login Here](#)". The background of the page is a blurred image of a doctor in blue scrubs and a surgical cap.

Login Page – Patient

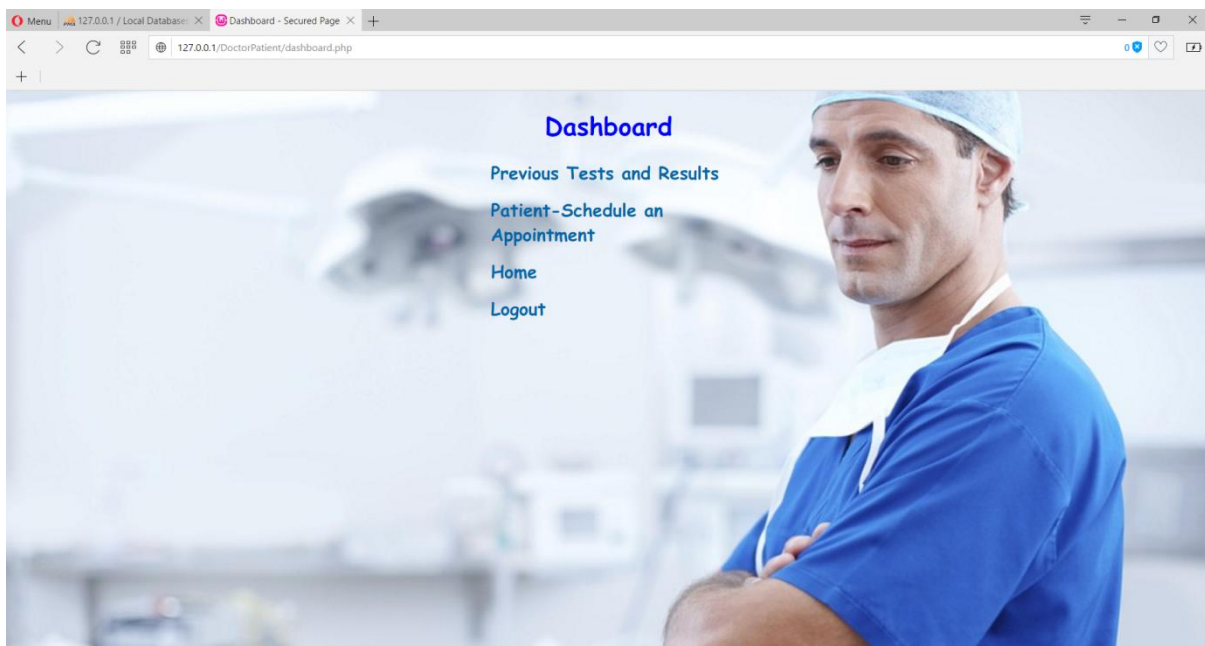


The screenshot shows a web browser window with the URL `127.0.0.1/DoctorPatient/login.php`. The page is titled "Log In" in blue text. It features a login form with the following fields: a text input for the username (containing "SunilKumar") and a password input field (containing "*****"). Below these fields is a "User Type" dropdown menu with options: "Patient" (selected), "Select...", "Doctor", "Lab Technician", and "Admin". A blue "Login" button is positioned below the dropdown. At the bottom of the form, there is a link that says "Not registered yet? [Register Here](#)". The background of the page is a blurred image of a doctor in blue scrubs and a surgical cap.

Welcome Page – Patient



Dashboard – Patient



Scheduling an Appointment

The screenshot shows a web browser window with the URL `127.0.0.1/DoctorPatient/patient.php`. The page title is "Doctor Appointment Scheduling". On the left, there are three calendar views for November 2016, December 2016, and January 2017. The main area displays a table of available time slots for various dates. The table has columns for dates from 11/27/2016 to 12/3/2016 and rows for time slots from 9 AM to 5 PM. The table is titled "Available time slots:". The data in the table is as follows:

Time Slot	11/27/2016	11/28/2016	11/29/2016	11/30/2016	12/1/2016	12/2/2016	12/3/2016
9 AM	Available	Available RitikaChowdri AnushaGandu		Available AnushaGandu			
10 AM		Available DivyaSingh		Available SushmaMitta			
11 AM		Available SushmaMitta		Available RitikaChowdri			
12 PM		Available SushmaMitta					
1 PM							
2 PM		Available VeenaGontu					
3 PM							
4 PM							
5 PM							

Appointment Confirmation

The screenshot shows the same web browser window as before, but with a modal dialog box titled "Request an Appointment" overlaid on the scheduling table. The dialog box contains the following fields and buttons:

- Start: 28/Nov/16 12:00 PM
- End: 28/Nov/16 1:00 PM
- Your Name:
- Buttons:

The background scheduling table is dimmed, showing the same data as in the previous screenshot.

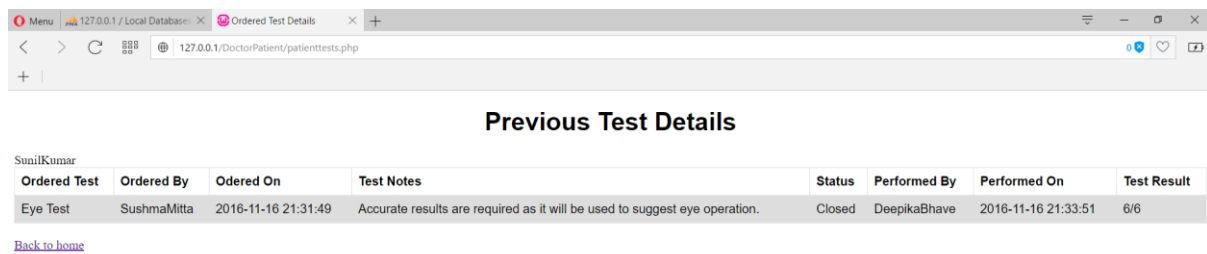
Requested Appointment

The screenshot displays a web browser window with the URL `127.0.0.1/DoctorPatient/patient.php`. The page title is "Doctor Appointment Scheduling". On the left, there are three calendar views for November 2016, December 2016, and January 2017. The main area shows a table of available time slots for various dates. The "11/27/2016" column is highlighted in orange and labeled "DEMO". The "11/28/2016" column shows a green bar for the 9 AM slot labeled "Available RitikaChowdri" and a green bar for the 10 AM slot labeled "Available AnushaGandu". The "11/29/2016" column is empty. The "11/30/2016" column shows a green bar for the 9 AM slot labeled "Available AnushaGandu", a green bar for the 10 AM slot labeled "Available DivyaSingh", and a green bar for the 11 AM slot labeled "Available SushmaMitta". The "12/1/2016" column is empty. The "12/2/2016" column is empty. The "12/3/2016" column is empty. The "11/27/2016" column also shows a green bar for the 12 PM slot labeled "Your appointment, waiting for confirmation".

Confirmed Appointment

The screenshot displays the same web browser window as the previous one, but the "11/27/2016" column is now highlighted in red and labeled "DEMO". The "11/28/2016" column shows a green bar for the 9 AM slot labeled "Available RitikaChowdri" and a green bar for the 10 AM slot labeled "Available AnushaGandu". The "11/29/2016" column is empty. The "11/30/2016" column shows a green bar for the 9 AM slot labeled "Available AnushaGandu", a green bar for the 10 AM slot labeled "Available DivyaSingh", and a green bar for the 11 AM slot labeled "Available SushmaMitta". The "12/1/2016" column is empty. The "12/2/2016" column is empty. The "12/3/2016" column is empty. The "11/27/2016" column also shows a green bar for the 12 PM slot labeled "Your appointment, confirmed".

Previous Test Details

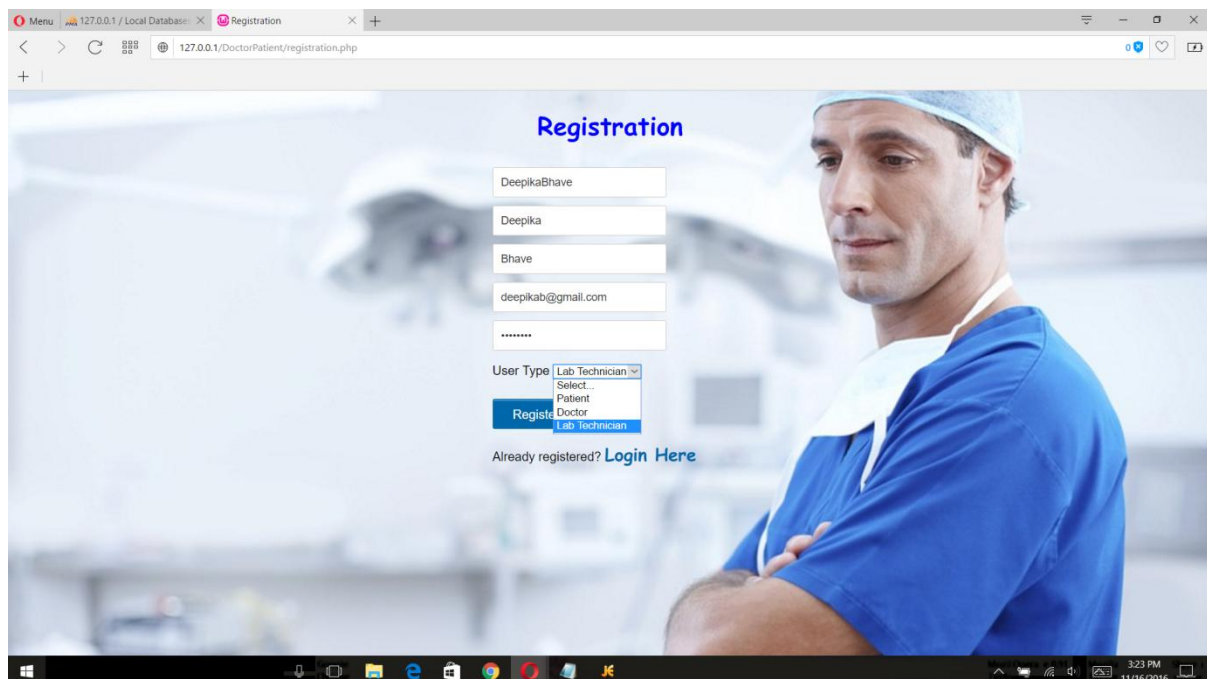


Ordered Test	Ordered By	Ordered On	Test Notes	Status	Performed By	Performed On	Test Result
Eye Test	SushmaMitta	2016-11-16 21:31:49	Accurate results are required as it will be used to suggest eye operation.	Closed	DeepikaBhave	2016-11-16 21:33:51	6/6

[Back to home](#)

Registration – Lab Technician

The login is possible only after the person has registered.



Registration

DeepikaBhave

Deepika

Bhave

deepikab@gmail.com

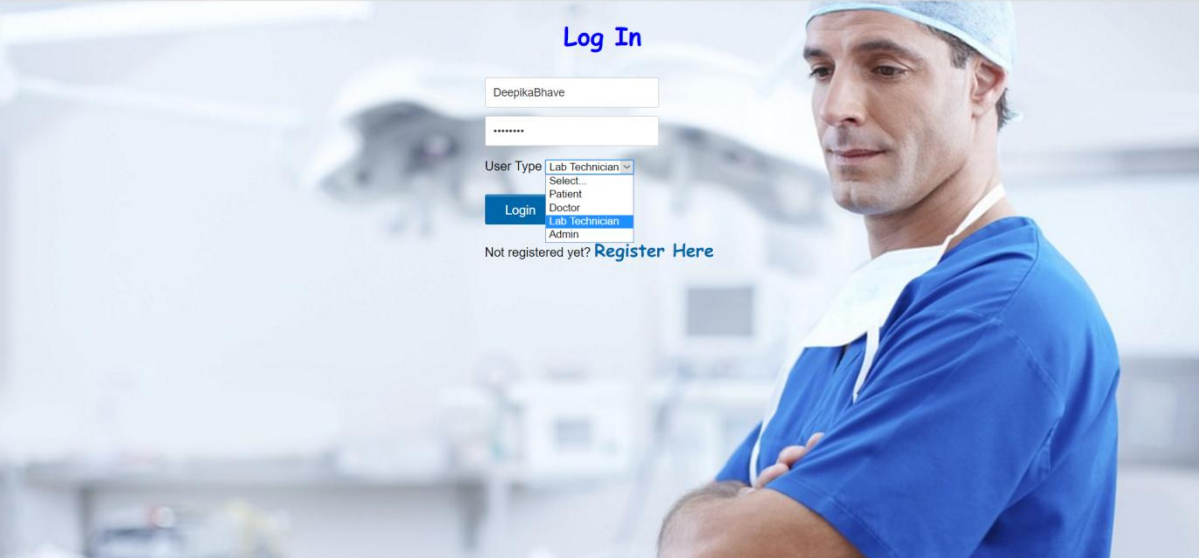
.....

User Type: Lab Technician
Select...
Patient
Doctor
Lab Technician

Register

Already registered? [Login Here](#)

Login – Lab Technician



Menu 127.0.0.1 / Local Database: X Login X Mail - Mitta, Sushma (UMi X lipid profile - Google Sear X +

127.0.0.1/DoctorPatient/login.php

Log In


DeepikaBhave

User Type Lab Technician Select Patient Doctor Lab Technician Admin

Login

Not registered yet? [Register Here](#)

Welcome Page – Lab Technician



Menu 127.0.0.1 / Local Database: X Welcome Home X +

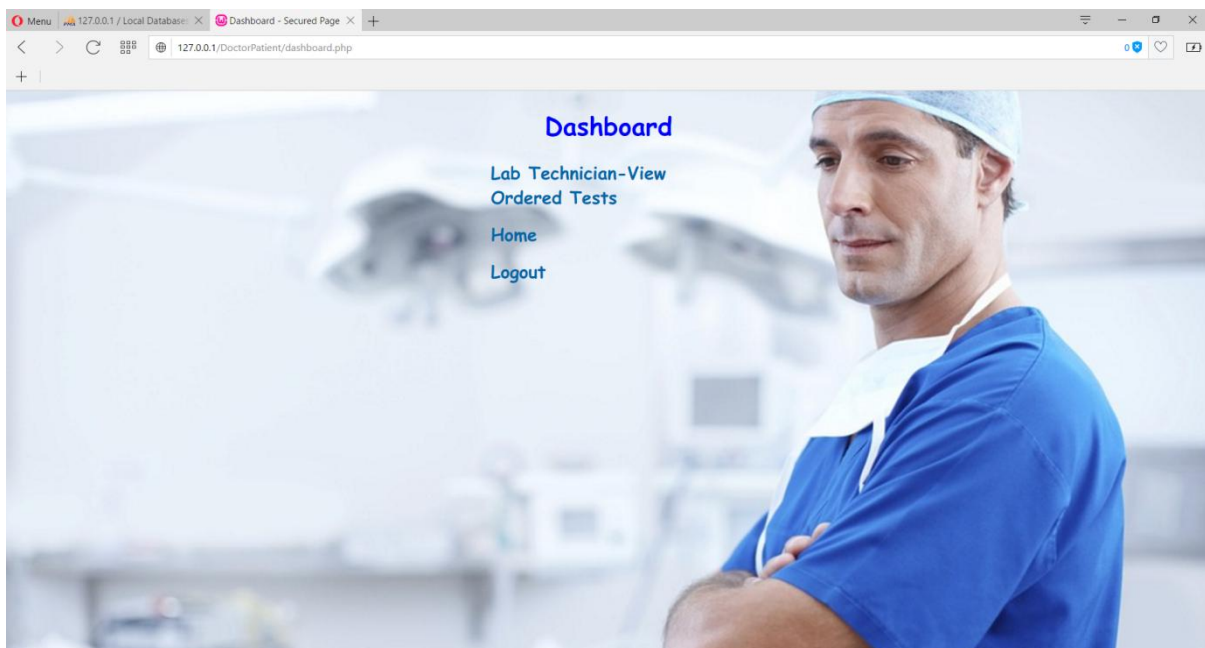
127.0.0.1/DoctorPatient/index.php

Welcome DeepikaBhave!

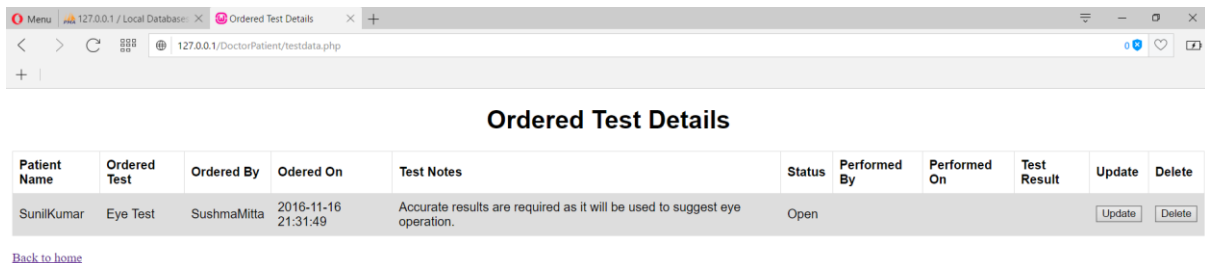
[Dashboard](#)

[Logout](#)

Dashboard – Lab Technician



Ordered Test Details

A screenshot of a web browser displaying the 'Ordered Test Details' page. The browser's address bar shows the URL '127.0.0.1/DoctorPatient/testdata.php'. The page has a light blue background. The title 'Ordered Test Details' is centered at the top. Below the title is a table with the following data:

Patient Name	Ordered Test	Ordered By	Ordered On	Test Notes	Status	Performed By	Performed On	Test Result	Update	Delete
SunilKumar	Eye Test	SushmaMitta	2016-11-16 21:31:49	Accurate results are required as it will be used to suggest eye operation.	Open				<button>Update</button>	<button>Delete</button>

[Back to home](#)

Test Update Form

Menu127.0.0.1 / Local Database: Update Test Order Record

127.0.0.1/DoctorPatient/updatedtestrec.php

Update Test Order Form

* required field

Lab Technician Name:

DeepikaBhave

Physician Name:

SushmaMita

Patient Name:

SunilKumar

Referred Test: Eye Test

Notes:

Accurate results are required as it will be used to suggest eye operation.

Status: Open

Test Result:

Update Order Test

Back to test data

Test Results

Menu127.0.0.1 / Local Database: Ordered Test Details

127.0.0.1/DoctorPatient/testdata.php

Ordered Test Details									
Patient Name	Ordered Test	Ordered By	Odered On	Test Notes	Status	Performed By	Performed On	Test Result	UpdateDelete
SunilKumar	Eye Test	SushmaMita	2016-11-16 21:31:49	Accurate results are required as it will be used to suggest eye operation.	Closed	DeepikaBhave	2016-11-16 21:33:51	6/6	UpdateDelete

[Back to home](#)

Registration – Doctor

Registration

SushmaMitta

Sushma

Mitta

sushma.mitta@gmail.com

User Type:

Already registered? [Login Here](#)

Login – Doctor

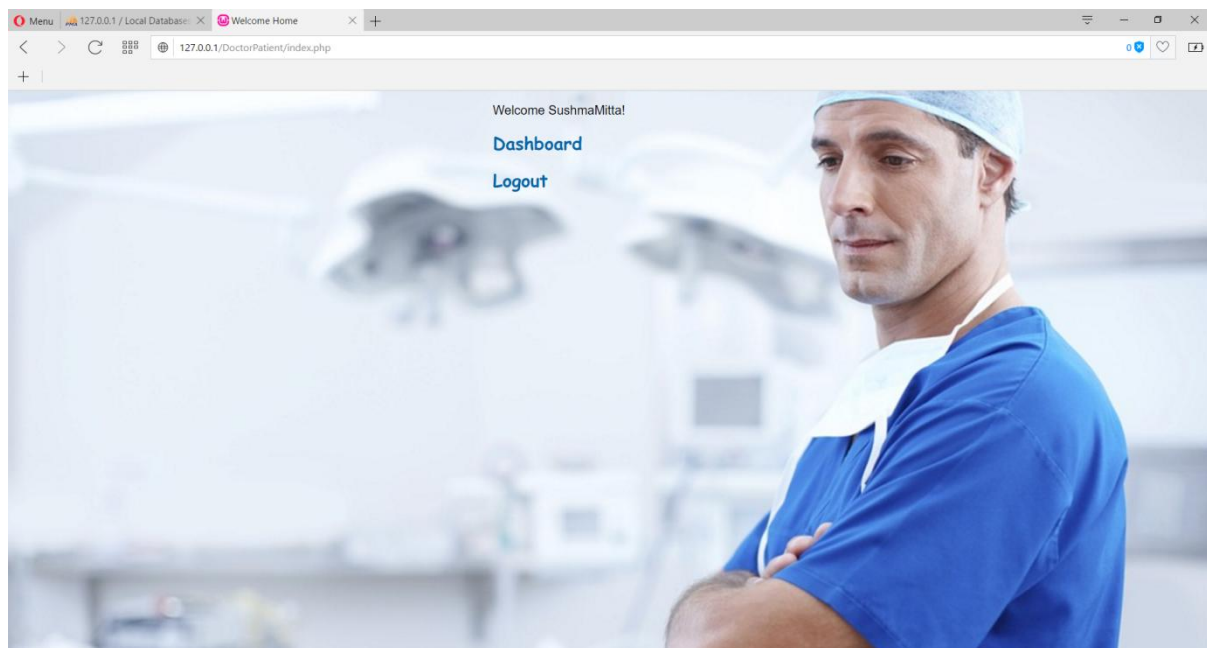
Log In

SushmaMitta

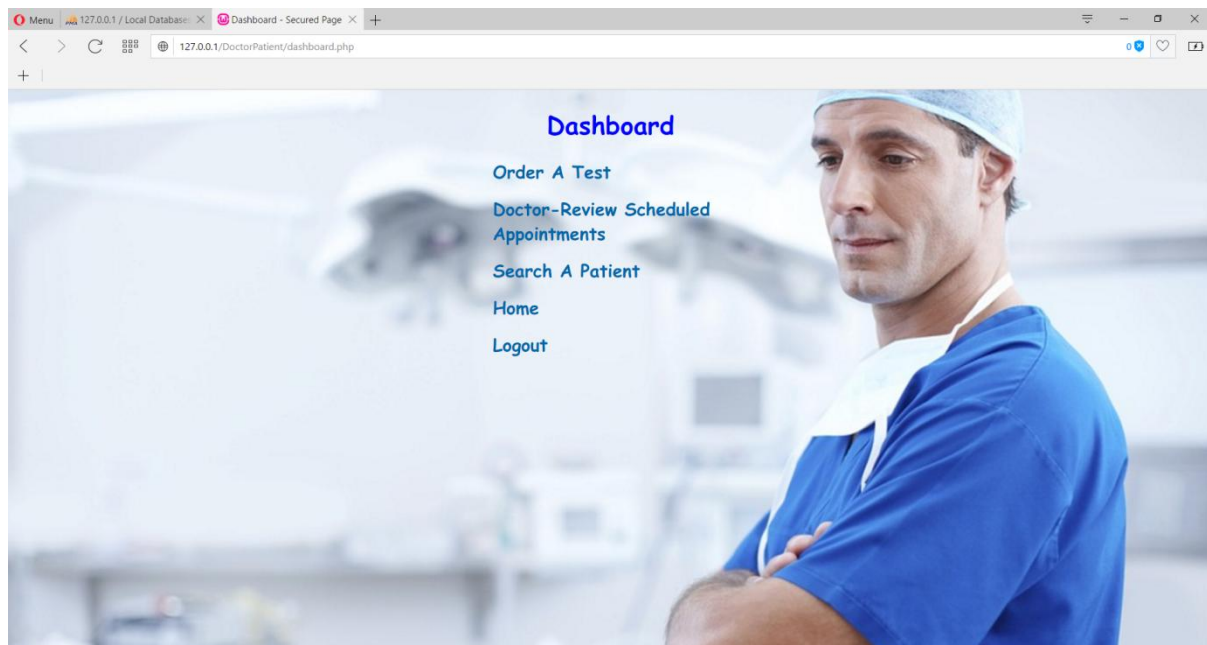
User Type:

Not registered yet? [Register Here](#)

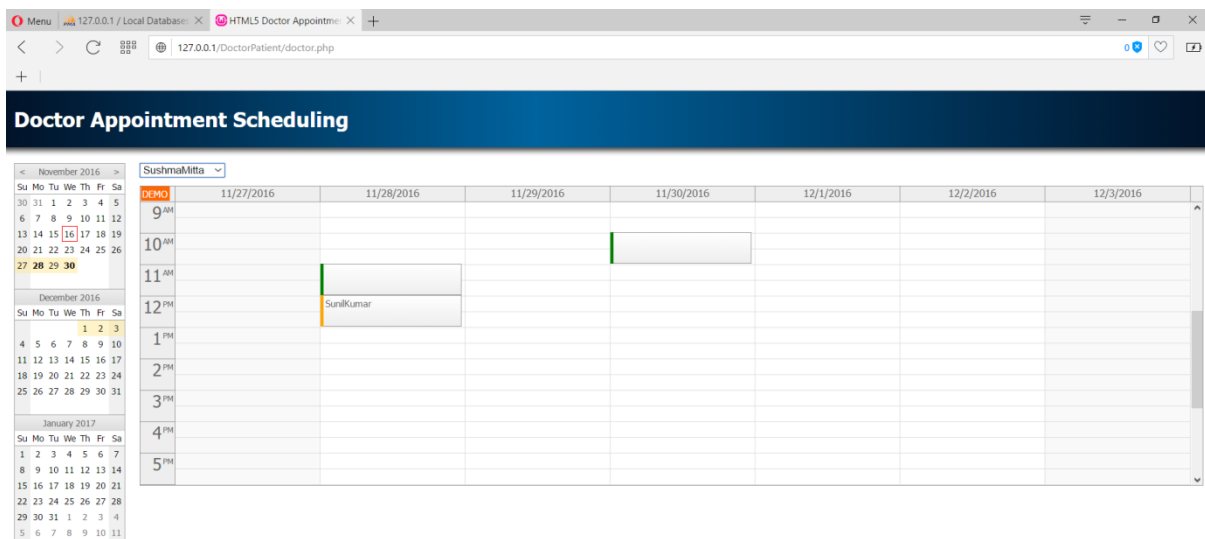
Welcome Page – Doctor



Dashboard – Doctor



Reviewing Appointments



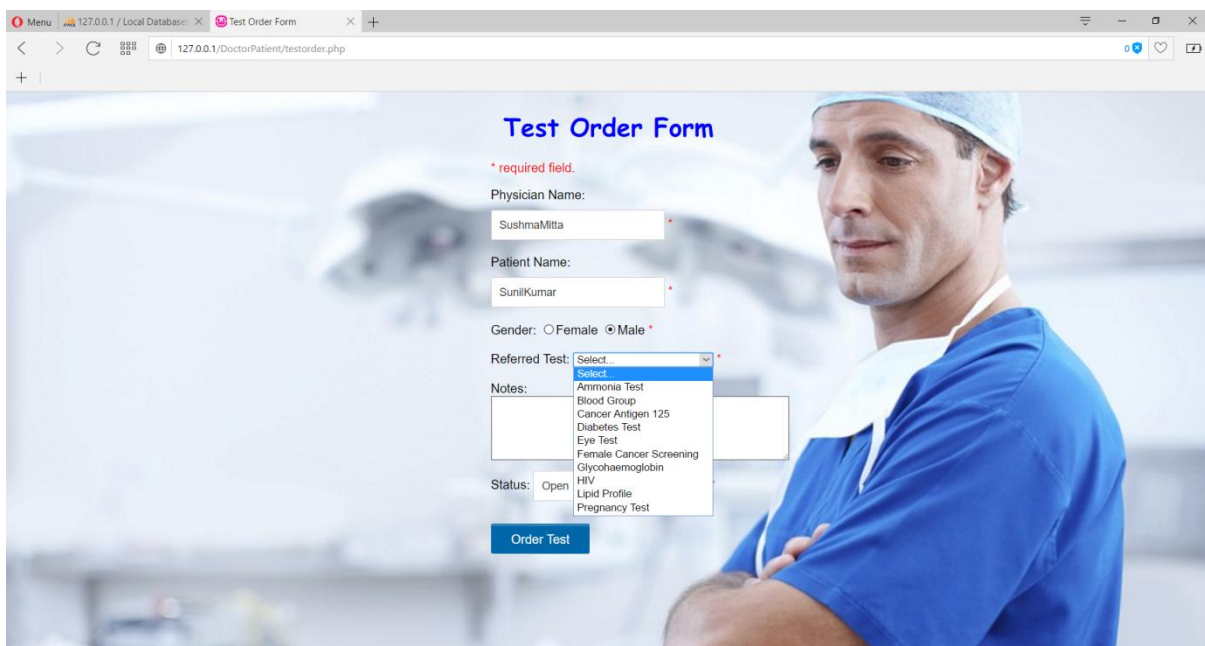
Doctor Appointment Scheduling

Calendar: November 2016, December 2016, January 2017

Appointment Schedule:

Time	11/27/2016	11/28/2016	11/29/2016	11/30/2016	12/1/2016	12/2/2016	12/3/2016
9 AM							
10 AM							
11 AM							
12 PM		SunilKumar					
1 PM							
2 PM							
3 PM							
4 PM							
5 PM							

Ordering tests for a patient



Test Order Form

* required field.

Physician Name: SushmaMitta

Patient Name: SunilKumar

Gender: ☐ Female ☒ Male

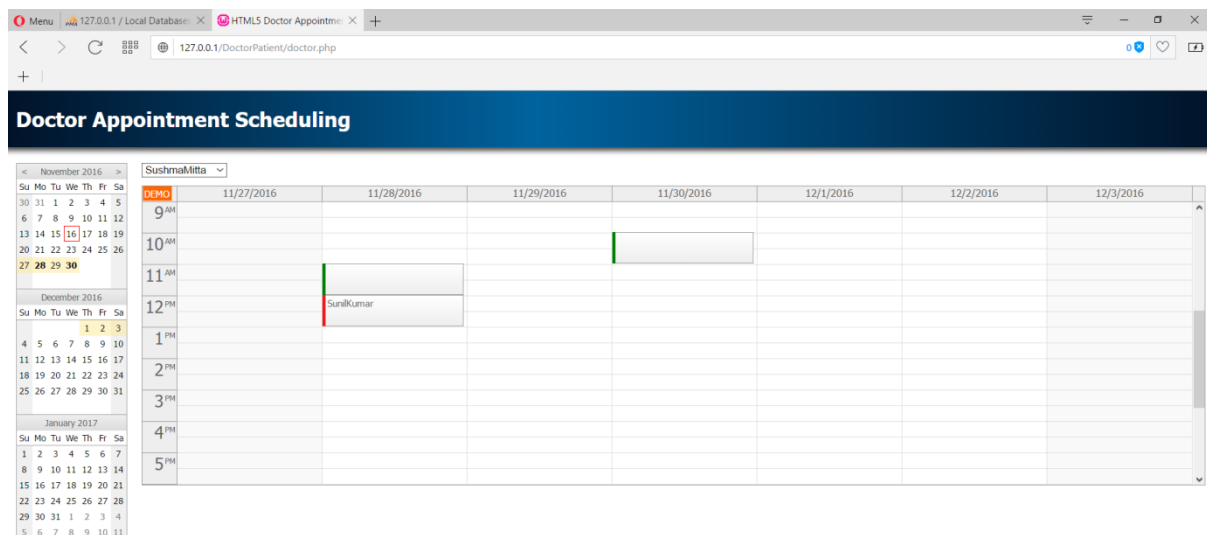
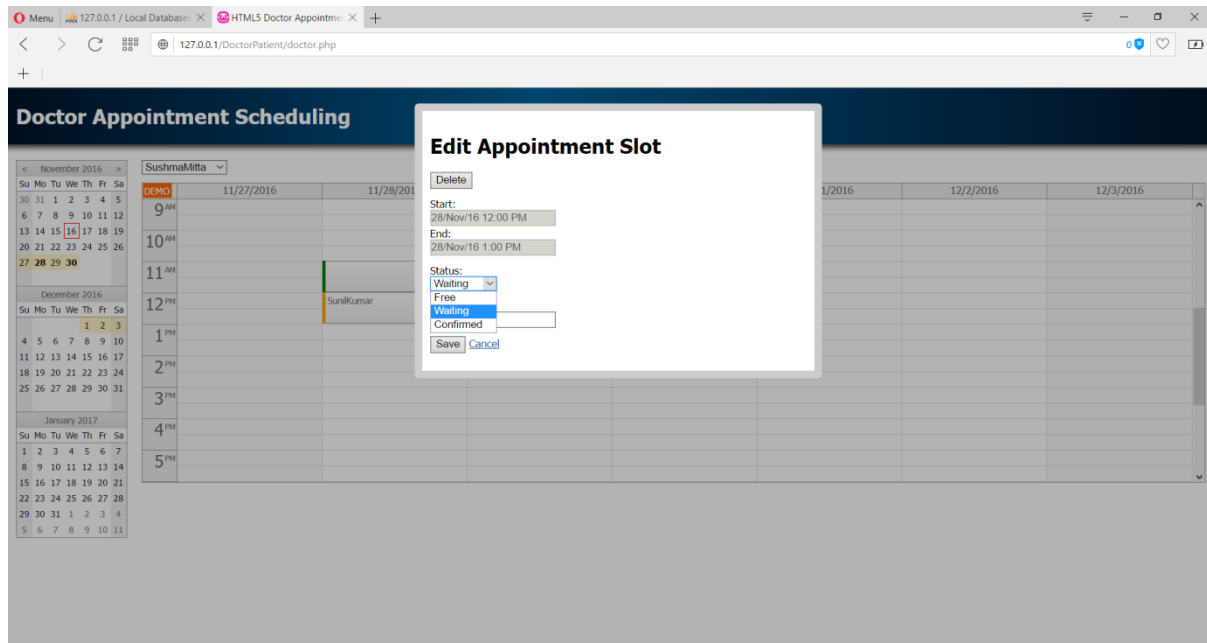
Referred Test: Select...

Notes:

Status: Open

Order Test

Confirming Appointments



Search Patient



Patient Test Details



Patient Test Details

Patient Name	Ordered Test	Ordered By	Ordered On	Test Notes	Status	Performed By	Performed On	Test Result
SunilKumar	Eye Test	SushmaMitta	2016-11-16 21:31:49	Accurate results are required as it will be used to suggest eye operation.	Closed	DeepikaBhave	2016-11-16 21:33:51	6/6

[Go Back](#)
[Go Back Home](#)

4. PERFORMANCE CRITERIA OF THE MODEL

Performance of the System

The project described in this paper is expected to decrease the manual intervention in recording the history of the patients' right from the initial admission/consultation to the doctor in a particular hospital till date.

In this project, we have made it possible by combining the EMR (Electronic Medical Record) with the additional features that include the submission/ordering of the tests online, making an appointment with the doctor online, sending the reports of a particular patient to the doctor.

Challenges in the System

The challenge faced in the system is incorporating the patient's transport EMR. Generally the transport EMR was previously ignored due to the inability to obtain the time limitations. Recent works have however made this electronic that would overcome the limitations.

5. CONCLUSION AND FUTURE SCOPE

Conclusion

The progress on health information exchange is increasing gradually. Despite the limitations of fully integrated medical record, this idea is being given importance and development is still in process in real time. There are limiting factors for the development of fully integrated medical record to a fully automated system. It also supports CER efforts. Despite these challenges, the EMR data holds for improving the provision of patient care.

Future Scope

The primary motive for creating the fully integrated medical record system was to develop a robust platform to support CER efforts.

Future development of this system will focus on automating the system to incorporate the real time data. Once this automation is done, this system will be able to provide the capability of real time queries.

References

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5. <http://stackoverflow.com/questions/61401/hidden-features-of-php>
6. <http://www.w3schools.com/php/>
7. <http://php.net/manual/en/language.functions.php>
8. <http://php.net/manual/en/language.functions.php>
9. <https://css-tricks.com/snippets/css/>
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11. http://blogs.verisign.com/identity/2008/02/security_of_online_medical_rec.php (Feb. 26, 2008, 15:14 CST).