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End To End Solution for Online Medical Consultation System

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ABSTRACT: The revolution of technology has impacted a variety of industries globally, likewise the healthcare industry is also evolving rapidly. It is another business opportunity to develop custom solutions for specific healthcare needs. However, in a busy life schedule for everyone healthcare takes the primary place but without visiting the doctor or a clinic. Our project will reduce manual work for maintaining records. Main aim of this project is to implement a online software application for maintaining drugs, patients and doctors information in a single application. It also delivers medication to patients on time. Using this system data is maintained in database and data retrieving and updating is easy process and old data can be easily retrieved. Doctors and patients can view this data from anywhere which will save time. This application is end user support and online consultation system.

I. INTRODUCTION

The use of web application in the business environment has become the standard. Main reasons are ease of maintenance as well as version release as it's made only on the central server without the need for access to a user's computer. In addition, web oriented applications are available over the internet for use in any location and on any kind of small or resource constrained device. Such web applications can be integrated with different other applications, control and management services, and management services, and other applications as well, to realize management, monitoring, reporting, etc. This is an app that helps patients to find the right doctor, book appointments and health checkups, order medicines, and consult doctors online. It is Software as a service (SaaS) tool which is an internet-based service to schedule an appointment with the doctor. It is an online healthcare appointment booking app/portal where patients can get immediate doctors' consultation. Patients can book an appointment at a convenient time. Not just that, patients can choose from a list of specialized doctors by going through their experience, reviews, and ratings, order medicines online, get health consultations, etc.

II. RELATED WORK

Vamadevan SAjay and Dorairaj Prabhakaran ,2011[1] "The Scope of Cell Phones in Diabetes Management in Developing Country Health Care Settings" undertook a study of mobile phones in Diabetes Management in developing countries. The research revealed that 60% of the end users use mobile which are smart phonesandcanbeusedtomonitordaytodaybasisofpatientsglucoselevelwithhelpofanexternal glucose monitoring tool as well as to Clinical guidelines and advice and alerts for physicians can be easily delivered through cell phones to stay informed about recentdevelopments.

Juliana Chen, Janet E Cade and Margaret Allman-Farinelli ,2015[2] "The Most Popular Smartphone Apps for Weight Loss: A Quality Assessment" .The purpose of this study was to evaluate the quality of the most popular dietary weight-loss smartphone apps on the commercial market using comprehensive quality assessment criteria, and to quantify the behavior change techniques (BCTs) incorporated.

Taher M. Ghazal, Mohammad Kamrul Hasan, Muhammad Turki Alshurideh, Haitham M. Alzoubi ,Munir Ahmad, Syed Shehryar Akbar , Barween Al Kurdi and Iman A. Akour ,2021[3] "IoT for Smart Cities: Machine Learning Approaches in Smart Healthcare" The paper explains the use of AI, blockchain, machine learning and IoT technologies for the development of smart healthcare systems and broadly for the development of smart cities that can truly enhance and optimize the accuracy of expected results. Sensor networks, IoT and machine learning therefore offer untapped potential to relieve doctors and better identify diseases. It is precisely because the health systems are facing major challenges due to an aging society, financial bottlenecks and growing mountains of (analog and digital) data, the use of modern technologies is becoming increasingly inevitable.

Romany Fouad Mansour, Adnen El Amraoui, IssamNouaouri, Vicente García Díaz, Deepak Gupta and Sachin Kumar, 2021[4] "Artificial Intelligence and Internet of Things Enabled Disease Diagnosis Model for Smart Healthcare Systems" This work has developed an efficient AI and IoT convergence-based disease diagnosis model for smart healthcare system. The presented model encompasses different stages namely data acquisition, preprocessing, classification, and parameter tuning. IoT devices such as wearables and sensors collect the data while AI techniques utilize the data to perform disease diagnosis. Then, iForest technique is executed to get rid of outliers that exist in the patient data.

Baha Ihnaini , M. A. Khan , Tahir Abbas Khan, Sagheer Abbas , Mohammad Sh. Daoud, Munir Ahmad and Muhammad Adnan Khan,2021[5] "A Smart Healthcare Recommendation System for Multidisciplinary Diabetes Patients with Data Fusion Based on Deep Ensemble Learning". This proposed model is presented to predict and recommend multidisciplinary diabetes disease in the patients quickly and efficiently. The ensemble deep ML model and data fusion technique are used for fast response and better accuracy rate. This model efficiently predicted and recommended whether the patient is a victim of multidisciplinary diabetes disease or not.

Wei Li1 ,Yuanbo Chai1 , Fazlullah Khan, Syed Rooh Ullah Jan, Sahil Verma,Varun G. Menon, Kavita, Xingwang Li ,2021[6] "A Comprehensive Survey on Machine Learning-Based Big Data Analytics for IoT-Enabled Smart Healthcare System" In this paper, they have presented a detailed survey of big data analytics in IoT health-care domain. They have thoroughly studied the literature and selected the most relevant and up to date surveys to find research gap. Furthermore, they have also provided a comprehensive and state-of-the-art literature on ML-based techniques for big data analytics in IoT smart health. A detailed discussion of their strengths and weakness was also provided.

XingqunXue ,Yuanyu Zeng , Yanjiao Zhang , Sunhae Lee and Zhigang Yan,2021[7] "A Study on an Application System for the Sustainable Development of Smart Healthcare in China" The purpose of this study is to explore ways to apply information technologies such as big data, Internet of things (IoT), mobile internet, and so on to the healthcare industry. By analyzing the impact path of such high-techs on healthcare, it intends to propose an application system for the sustainable development of so called ''smart healthcare''. It identifies the influencing factors of smart healthcare from three different perspectives: society, economy and environment. It then constructs an indicator system containing 14 factors, and comprehensively analyzes the importance and dependence of the factors by using Fuzzy Decision-making Trial and Evaluation Laboratory (DEMATEL) and Interpretative Structural Modeling Method (ISM) based on a multi-level hierarchy model.

Carol E. Smith, Ryan Spaulding, Donna Macan Yadrich and Richard Gilroy, 2015[8] in there Paper "mHEALTH CLINIC APPOINTMENT PC TABLET: IMPLEMENTATION, CHALLENGES AND SOLUTIONS" has explained the mHealth clinic appointment can simultaneously connect multiple professionals and families on the iPad Mini screen. The data collected from patients' provided important history and visual information for evaluating HPN patients' clinical condition. And patients themselves transmitted photographs and videos for timely assessment of symptoms. This facilitated their care without increasing cost to the patient and saved them travel time. In their mHealth clinics technical issues were readily identified and solutions to resolve these were found. MHealth advantages include early detection of infection, accurate assessment of IV insertion sites and/or detection of flu id balance issues through visual and history assessment of patients requiring HPN. The long-term goals of this study are to gain new knowledge about mobile management of complex chronic conditions using PC tablets. Mobile technology gives professionals an important opportunity for assessment of early symptoms and signs of IV infection or bowel illness exacerbations.

Disha Kumar and Monisha Arya ,2014[9] In this article "mHEALTH IS AN INNOVATIVE APPROACH TO ADDRESS HEALTH LITERACY AND IMPROVE PATIENTPHYSICIAN COMMUNICATION" has explained Low health literacy is a barrier for many patients in the U.S. Patients with low health literacy have poor communication with their physicians, and thus face worse health outcomes. Several government agencies have highlighted strategies for improving and overcoming low health literacy. Mobile phone technology could be leveraged to implement these strategies to improve communication between patients and their physicians. Text messaging, in particular, is a simple and interactive platform that may be ideal for patients with low health literacy

Sanne van der Weegen, Renée Verwey , Marieke D Spreeuwenberg and Huibert J Tange, 2013[10] in his paper "The Development of a Mobile Monitoring and Feedback Tool to Stimulate Physical Activity of People With a Chronic Disease in Primary Care:A User-Centred Design" has study that demonstrates that a user-centred approach brings in valuable details (such as the requirements for feedback in activity minutes per day) to improve the fit between the user, technology, and the organization of care, which is important for the usability and acceptability of the tool. The tool embedded in primary care will be evaluated in a randomized controlled trial.

Juliana Chen, Janet E Cade and Margaret Allman-Fairnelli, 2015[11] In this paper "The Most Popular Smartphone Apps for Weight Loss: A Quality Assessment" has studied the most popular commercial apps for weight management are suboptimal in quality, given the inadequate scientific coverage and accuracy of weight-related information, and the

relative absence of BCTs across the apps reviewed. With the limited regulatory oversight around the quality of these types of apps, this evaluation provides clinicians and consumers an informed view of the highest-quality apps in the current popular app pool appropriate for recommendation and uptake. Further research is necessary to assess the effectiveness of apps for weight management.

Asa Svensson and Christel Larsson,2015[12] in this paper "A Mobile Phone App for Dietary Intake Assessment in Adolescents: An Evaluation Study" has evaluated the mobile phone food record app did not accurately assess EI of adolescents when compared with TEE from the SWA in this evaluation study. Having a weekend day in the record of EI improved reporting accuracy, and BMI z-score was negatively associated with reporting accuracy. Furthermore, the mobile phone app was able to accurately rank adolescents' TEE, as well as the physical activity level among boys by using only one question about physical activity at the end of the day. Further development of the mobile phone app method should focus on improved functions to search and record consumed foods, for example, by automatizing these steps as much as possible. Users could, for example, have the option of sending food photographs to the researcher. The app should also be developed for iPhone so that more participants will be able to use their own mobile phones.

ChandrashanPerera and Rahul Chakrabarti, 2013[13] in this paper "THE UTILITY OF MHEALTH IN MEDICAL IMAGING" has researched that Mobile devices are uniquely positioned to make a significant contribution to medical imaging. Portability, computing power, accessibility and built in internet connectivity are well described advantages of mobile devices. There is a growing body of research which supports the use of mHealth technologies for imaging, and a number of novel uses are described in the literature.

Wendy Nilsen, Tisha Wiley, William T Riley and Misha Pavel, 2012[14] in this paper "Advancing the Science of mHealth" has explained the science of mobile and wireless health (mHealth) is a nascent and rapidly growing field. These technologies provide the potential to advance research, prevent disease, enhance diagnostics, improve treatment, reduce disparities, and increase access to health services and lower health care costs in ways previously unimaginable. Real-time, continuous biological, behavioral, and environmental data collected by wireless and mobile technologies should improve our understanding of the etiology of health and disease, particularly when integrated with data from areas such as genomics, biomarkers, and electronic medical records.

Thyra de Jongh, IpekGurol-Urganci and VlastaVodopivec-Jamasek,2012[15] in this review of "Mobile phone messaging for facilitating self- management of long-term illnesses "has explained about Mobile phone messaging applications, such as Short Message Service (SMS) and Multimedia Message Service (MMS), may present convenient, cost-effective ways of supporting self-management and improving patients' self-efficacy skills through, for instance, medication reminders, therapy adjustments or supportive messages.

Nisha M. Luniya, Rucha R. Sali, Sanjana S. Deshmukh, Arti N. Pandharpure and Prof. Rohit K. Bamane, 2021[16] .The main objective is to develop internet applications particularly "Virtual Treatment and Consultation System". That covers all the sides of creating appointments for doctors. It allows health care provides to enhance operational effectiveness, cut back medical errors, reduce time consumption and enhance the delivery of quality of care. This system facilitates the reduction of the issues that occur once using the manual system and helps patients to skip endless queues.

Hannah E Payne, Cameron Lister, Joshua H West and Jay M Bernhardt , 2015[17] "Behavioral Functionality of Mobile Apps in Health Interventions: A Systematic Review of the Literature" .The purpose of this systematic review was to systematically search and describe the literature on mobile apps used in health behavior interventions, describe the behavioral features and focus of health apps, and to evaluate the potential of apps to disseminate health behavior interventions.

Abu Saleh Mohammad Mosa ,IllhoiYoo and Lincoln Sheets, 2012[18] "A Systematic Review of Healthcare Applications for Smartphones" In this study, they discussed many smartphone-based healthcare applications from the literature. These applications were grouped according to targeted users (i.e., clinicians, medical and nursing students, and patients). These applications are not intended to replace desktop applications, but to add to existing technologies for better healthcare. The functionalities of the applications are growing day by day and new functionalities are available with every major release. The work of healthcare professionals is very mobile in nature.

Yaling L,2021[19] "Design of Psychological Consultation System Based on Weighted Fuzzy Hybrid Algorithm" The performance of the system is verified theoretically and experimentally. The system has high security and low online consultation delay when carrying out psychological consultation. Specifically, compared with the system based on WPF, the system security is significantly improved, and the safety factor can reach 0.98. Compared with the system based on support vector machine, the online consultation delay is significantly reduced, and the maximum delay is less than 0.5s. Therefore, it fully shows that the consultation system based on a weighted fuzzy hybrid algorithm can better

meet the requirements of psychological consultation. Although our method has achieved good performance so far, it still fails to achieve comparable accuracy in complex environments. In addition, the training of the model is more constrained by some conditions. In the future, we will further optimize the model to improve training speed while ensuring accuracy.

Jemal Hanen, ZiedKechaou and Mounir Ben Ayed, 2016[20] "An enhanced healthcare system in mobile cloud computing environment" The purpose of this is to provide mobile healthcare users easy and quick access to the resources and offer a variety of distributed services. The aim of applying MCC in healthcare applications is to reduce the limits of traditional medical applications (e.g., security, small storage, and medical errors).

III. METHODOLOGY

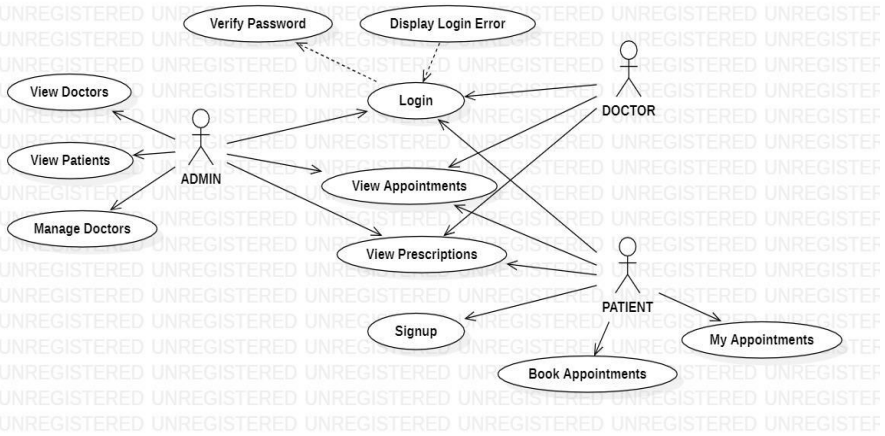

Fig 3.1 Use case diagram

The mechanism of the End to End solution for online medical consultation system is detailed in this section. This smart application works on 3 instances such as doctor appointment, doctor consultancy and medication delivery services.
A fully functional project based on End to End solution for online medical consultation system which uses PHP Language. It has a number of important features that will allow the users to manage their hospital records, transactions, and more. This system as well as the web application's concept is all clear, it's the same as real-life scenarios and well-implemented on it.
Moving on, this system focuses mainly on dealing with the patient, doctor records. In addition, the system allows creating a patient's personal account too. This project is divided into three categories. They are Admin Panel, Patient Panel, and Doctor Panel. In an overview of this web application, the user can simply make an appointment. Meaning, each user will have to fill up an appointment form from the client side. The form consists of fields such as patient name, address, number, and selection of department and doctor. During this procedure, the system creates personal accounts for each patient too.

Patient's Account
After making an appointment for the very first time, the user can log in to the system and check their appointment status. By default, each appointment is set to pending status. Which later, the doctor should approve or reject it in order to start their treatment process. Also, the patient can remove their appointments anytime. From a patient's panel, he/she can update their profile, view treatment records, and prescription records. Under the treatment section, a patient can view all the records such as treatment type, doctor's name, date, and total charge. Similarly, the prescription section displays the date, name, and quantity of the medicines with the total bill charge.

Doctor's Panel
Each doctor will have their own personal account which lets them access the system. Here, the doctor can view all the pending appointments. Each appointment has options that allow the doctor to approve or reject them. After approving the appointment, the doctor can view the patient's profile and appointment record. For the rest, the doctor has to maintain each by filling up their treatments. In order to set a treatment record, the user has to select a treatment type, description, date, and upload treatment files. After the completion of treatment records, the doctor can now proceed towards the prescription section. For the prescription, the doctor has to select available medicine, date, and enter quantity and dosage. After the submission of the prescription record, the system generates the total bill for the patient.

Manage Visiting Hours, Patients and services

Additionally, a doctor can set up their visiting hours by selecting starting and ending times. In terms of patients record, the doctor can view all the available patients with their respective information. When comes to income report, each doctor will have their own consultancy charge. And these consultancy charges are shown with respect to their number of patients. As a result, these sections will display the doctor's total earnings. Besides, the doctor can list their services which include their respective department's attachment to the patient's name, and treatment details.

Admin Panel

On the other hand, the admin has full control over the system. He/she can view all the existing records of the hospital. An admin can manage patients, doctors, their departments, treatment types, and medical records. An admin has the right to register a doctor's account. For this, the admin has to set the doctor's account under various hospital departments too. The admin can view all the appointment records too. Also, the admin has to maintain billing records for each patient's treatment. In order to maintain the payment of each patient, the user has to enter the discount amount and the reason for it. After the payment, the patient can view all the reports from their own personal accounts.

IV. EXPERIMENTAL RESULTS

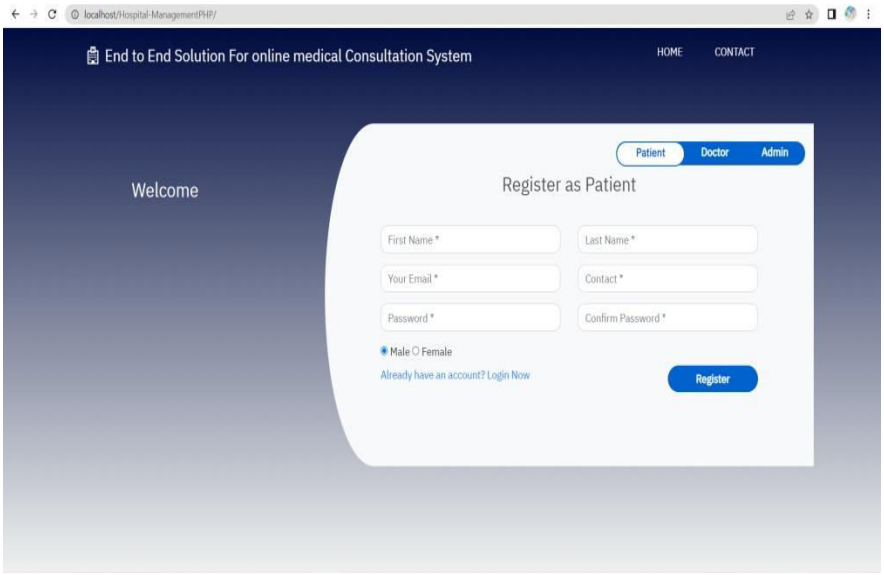

Fig 4.1 Patient Login Page

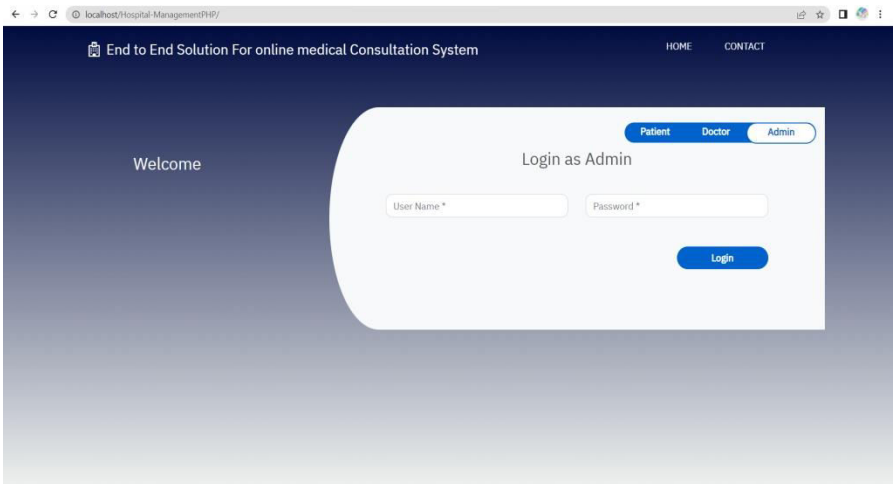

Fig 4.2 Admin Login Page

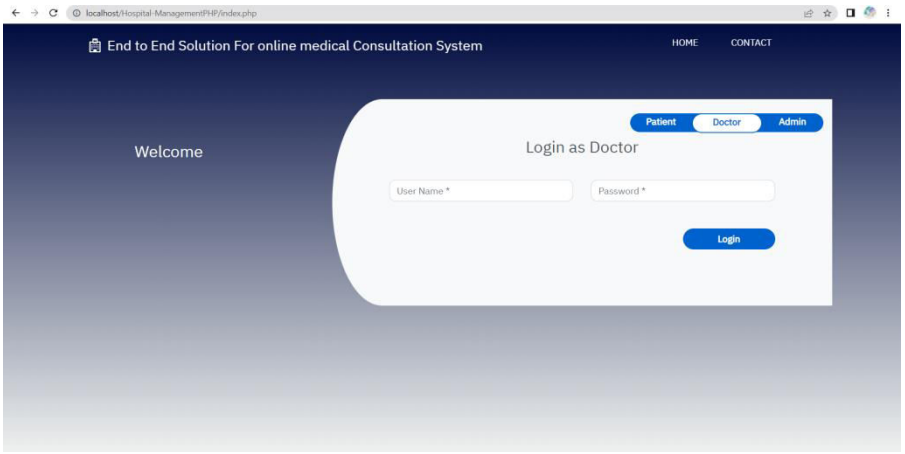

Fig 4.3 Doctor Login Page

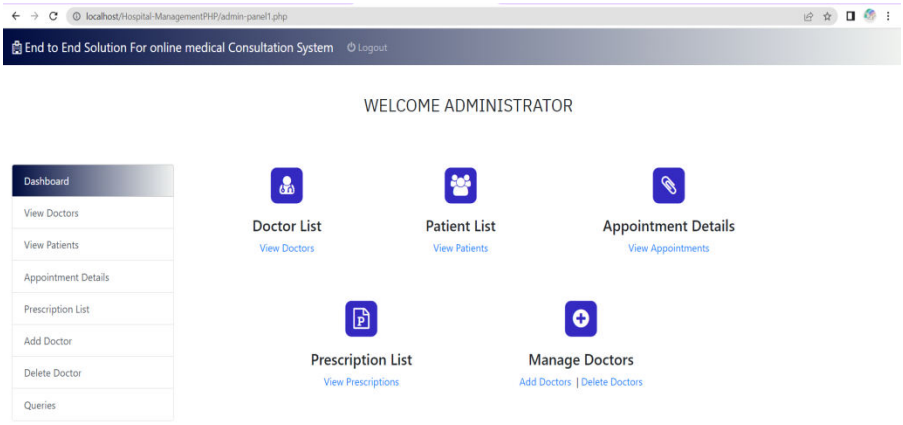

Fig 4.4 Admin Dashboard

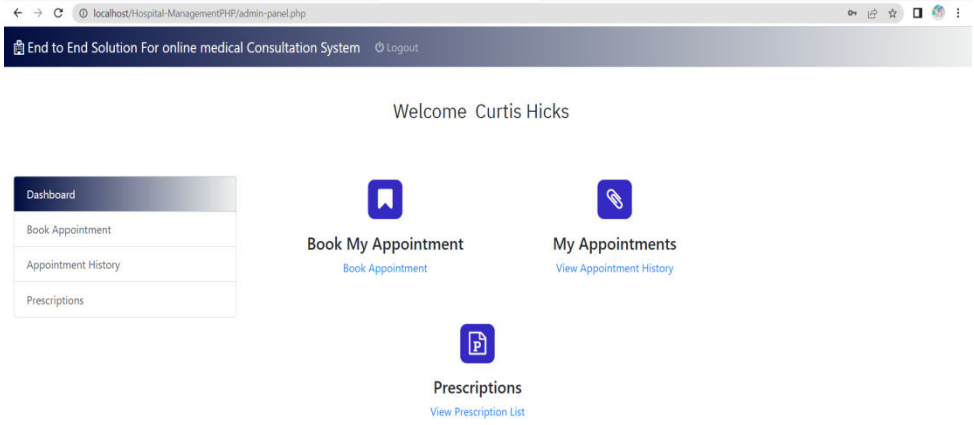

Fig 4.5 Patient Dashboard

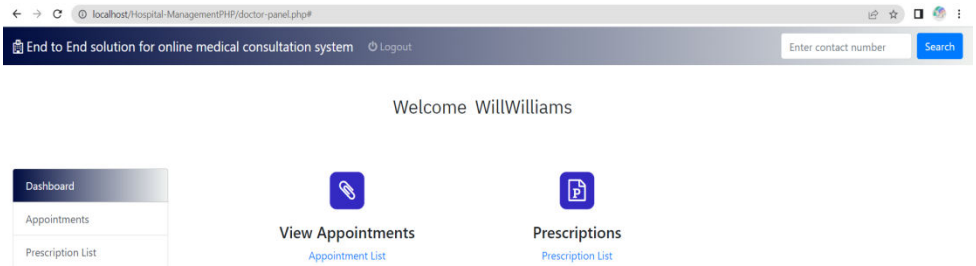

Fig 4.6 Doctor Dashboard

V. CONCLUSION

We have implemented a project that represents real-time End to End solution for online medical consultation system integrated with web application, which focuses mainly on dealing with the patient, doctor, and hospital records. Also, the system displays all the available hospital departments and their respective doctors. In addition, the system allows creating a patient's personal account too. And also provides payment option.The literature review assisted us in comprehending the existing technology's shortcomings. The gaps were identified and the problem was formulated. We developed a application for real-time booking appointments and consultation that yielded satisfactory results and achieved objectives by developing appropriate application using various tools and technologies.

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