

Online Telemedicine: A Cloud based Approach

Pankaj Lathar

Department of Information Technology

Ch. Brahm Prakash Government Engineering College

Jaffarpur, New Delhi 110073, Email: Pankajlathar@gmail.com

Abstract— *Telemedicine, like many emerging technologies, has no universally accepted definition despite the fact that telemedicine has been demonstrated for more than four decades. This is due, in large part, to the complexity of the communication, technology and equipment which continues to rapidly evolve providing more application opportunities. Telemedicine is the use of electronic communication networks for the transmission of information and data related to the diagnosis and treatment of medical conditions. In the current medical service the patient needs to meet the doctor directly and consult them to get the prescription. This will consume more time for the outstation patients. It will affect their personal and office work also. Though the patients are already suffering by some disease they need to travel lot of distance to meet the doctor for checkup. Our proposed system mainly helps the outpatient to consult the doctors easily and discuss about their problems and solve through online. It also helps the doctors by providing all the patient's history and information online so that they can access that information from any part of the world.*

Keywords— *Telemedicine, Cloud Computing*

I. INTRODUCTION

One of the great challenges facing humankind in the 21st century is to make high quality health care available to all. Such a vision has been expressed by the World Health Organization (WHO) in its health-for-all strategy in the 21st century. Realizing this vision will be difficult, perhaps impossible, because of the burdens imposed on a growing world population by old and new diseases, rising expectations for health, and socioeconomic conditions that have, if anything, increased disparities in health status between and within countries. Traditionally, part of the difficulty in achieving equitable access to health care has been that the provider and the recipient must be present in the same place and at the same time. Recent advances in information and communication technologies, however, have created unprecedented opportunities for overcoming this by increasing the number of ways that health care can be delivered. This applies both to developing countries with weak or unstable economies and to industrialized countries. The possibilities for using information and communication technologies to improve health-care delivery ('health telematics') are increasingly being recognized. Such a commitment to improve health-care delivery, by utilizing information and telecommunications technologies, is also being considered by those with the financial means to do so. At the national and subnational level, there is also evidence of governmental interest in the benefits that these technologies might bring to health care. Telemedicine, the area where medicine and information and telecommunications technology meet, is probably the part of this revolution that could have the greatest impact on health-care delivery.

Telemedicine is the delivery of health care and the exchange of health-care information across distances. The prefix 'Tele' derives from the Greek for 'at a distance'; hence, more simply, telemedicine is medicine at a distance. As such, it encompasses the whole range of medical activities including diagnosis, treatment and prevention of disease, continuing education of health-care providers and consumers, and research and evaluation.

II. EXISTING SYSTEMS

Phone-Based Telemedicine: Phone-based telemedicine is simply telemedicine where the link between the patient's location and that of the medical expertise is by telephone which may be called as healthcare by telephone. In this approach of Telemedicine the patients consult the doctor via telephone and the doctor diagnoses the patients orally asking what are the symptoms and problems faced by the patients regarding their health. In this approach it will be very difficult for the doctor to analyze the patient's current health condition clearly.

Even the patients cannot share the diagnostic reports through phone. So this approach is not advised if the patients have serious health issues and it may also mislead the doctor of the patient's health condition as the doctor will not get the clear cut idea of the patient's health condition. Also in this approach there might a chance of others to interfere and hear the conversation hence the security is very less in the existing system.

E-mail Based Telemedicine: A structured analysis of peer-reviewed literature about the delivery of health services by email was undertaken for this review. A total of 185 articles were included in the analysis. These articles were thematically categorized for medical specialty, participants, sub-topic, and study design and service-delivery application. It was shown that email-based telemedicine can be practiced in a large number of medical specialties and has application in primary consultation, second opinion consultation, tele-diagnosis and administrative roles (e.g. e-referral). Email has niche applications in low-bandwidth, image-based specialties (e.g. dermatology, pathology, wound care and ophthalmology) where attached digital camera images were used for tele-diagnosis. Diagnostic accuracy of these images was the predominant topic of research and results show email as a valid means of delivering these medical services. Email is also often used in general practice as an adjunct for face-to-face consultation. Further, a number of organizations have significantly improved the efficiency of their outpatient services when using email as a triage or e-referral system. Email-based telemedicine provides specialist medical opinion in the majority of reviewed services and is most likely to be instigated by the patient's primary care giver. However, email-consultations between patient and primary care and patient and secondary care are not uncommon. Most email services are implemented using ordinary email. However, a number of organizations have developed purpose-written email applications to support their telemedicine service due to impediments of using ordinary email. These impediments include lack of management tools for: the allocation and auditing of cases for a timely response and the co-ordination of effort in a multi-clinician, multi-disciplinary service. The ability to encrypt ordinary email thereby securing patient confidentiality is also regarded as difficult when using ordinary email. Much of the reviewed literature is descriptive or anecdotal and hence, suffers from lack of conclusive results regarding positive patient outcomes. This may account for email-based telemedicine generally being regarded as underutilized. Although Email based Telemedicine has separate accounts using which either a doctor or patient will be authenticated, in Email based telemedicine it is difficult to track message transactions between the patient and the doctor. Email based Telemedicine is not consistent as the mail transactions between the patient and the doctor will be distributed, and it is not stored in a single place it may be difficult to keep track of the record of their mail transactions. But our customized web site provides the features of having separate authentications for the patient and doctor login. We provide all the data transactions to be stored in one place so that we can keep track of their records. We also track the patient and the doctor history so as to make them easy to look at the previous records from a single place. In Email based Telemedicine there is a more vulnerability for the emails to get hacked by the hackers however secure the data in the email may be as it is encrypted. As the Emails can be sent by anyone it is not secure and it affects the privacy of them. Our customized Tele-Medi website provides privacy as only the registered patient can contact the doctor for consultation. And also our website provides security as to keep away from hackers and third party users through secure login and validation; thereby we can secure patient confidentiality in an effective manner [2].

Proposed System: We proposed a customized telemedicine application for which we have designed our own website in which each and every patient need to login and the login information of the patient is encrypted. Here the patient has the rights to choose a specialist doctor based on his disease and he can fix an online appoint with the particular doctor and he can share the disease information and also we have provided an option for the patient to upload the diagnostic so that It helps the doctor to track the patient history and also the current situation of the patient and the doctor can provide a good service through online. This application is mainly designed for outstation patient to save their time of simply travelling and waiting in the hospital.

Advantages of Proposed System:

- 1) The patient can contact the doctor through online and share the health information.
- 2) Since the information is shared in an internal website only the doctor can receive the details hence the secrecy is maintained in proper way.
- 3) Doctor can get the patients current diagnostic information so that he can exactly identify the current condition of the patient and provide proper solution for their health issue.
- 4) All the patient history and doctor prescription history, suggestion date everything is saved in a proper manner so that it can be retrieved any time based on the requirement.

III. SYSTEM ARCHITECTURE

Functional Requirements: The software must allow input of patient data from patient (initial) Home, secured access at Physician and Nurse Workstations, and from the data streaming real-time monitoring equipment. **But,** A web-based system can allow initial patient information to be gathered by a dumb terminal in office or from patient's own computer. The software must request username and password for access to data, only after authentication will allow access to the system. The software must require high levels of error correction and input validation. The software must allow browsing by the physician of historical medical information of his/her patients only. The software must identify the patient by a unique numeric identifier derived from a function. The software must retrieve, update, and store data from multiple input locations including but not limited to hospital workstations, physician workstations and electronic monitoring equipment. The software to be developed must display the correct patient name. The software to be developed shall display the correct time of day in compliance. The software to be developed must operate without interruption twenty-four hours a day. The software must allow full and complete record search queries by Physicians. The software must enable output of real-time data and imagery from electronic diagnostic equipment through PHP application which run in the web browser.

But, Nurses at workstation, patients or doctors at desktop can access this data. The software must retrieve and sort medical record information and allow for screen.

Non- Functional Requirements: The software interface must follow design conventions which allow for familiar location of drop own menus, help etc. Input errors will be returned in red with appropriate message box. Incorrect login credentials and failure will produce a red flag.

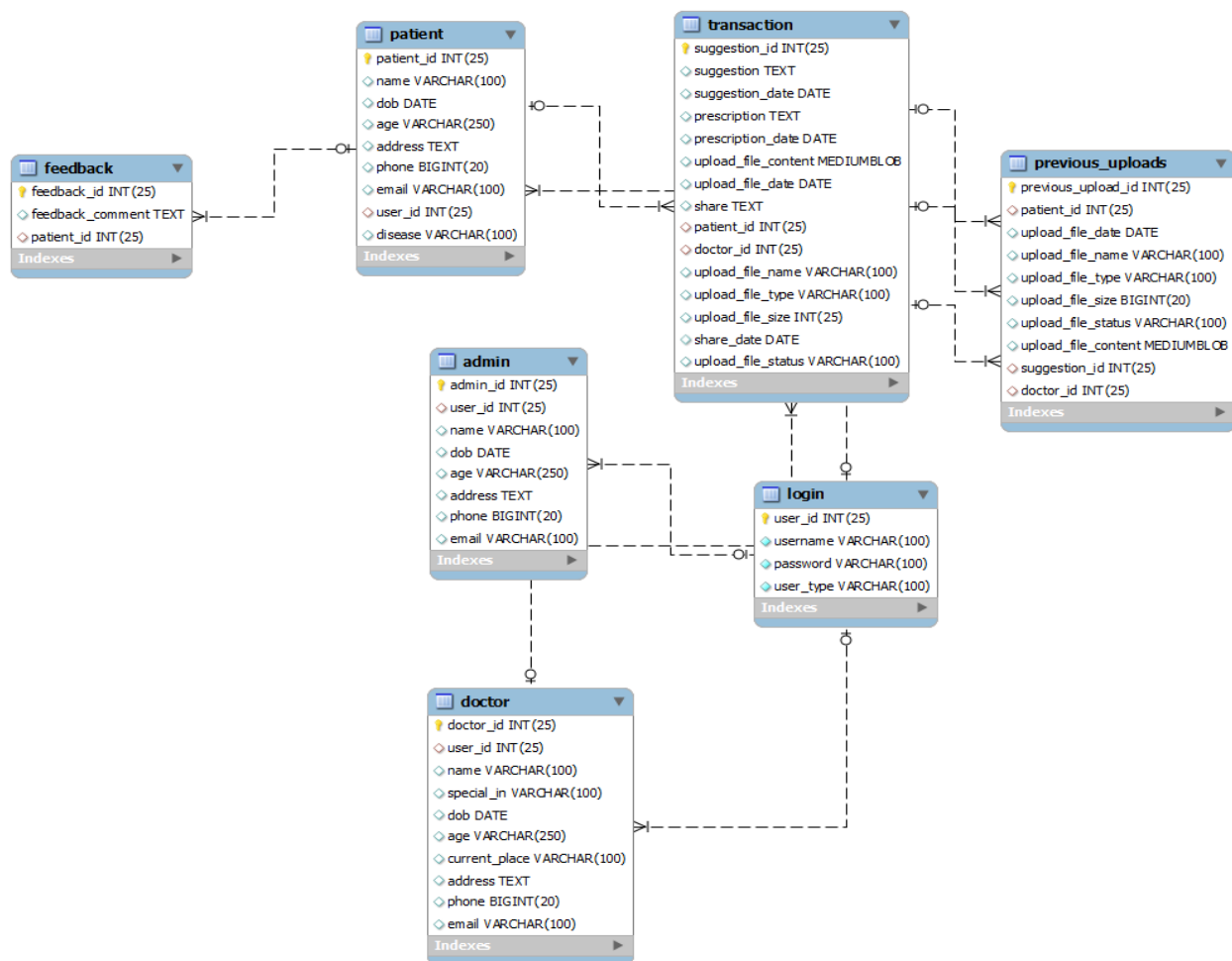


Figure 1: Logical Database Requirements

Figure 1 describes the database connectivity among admin, login, transaction, previous uploads, transaction, patient, doctor and feedback. And this diagram shows the entire working environment involved between admin, patient and doctor. By seeing this figure everyone can easily understand that how it works. And it describes the database functionality among these fields.

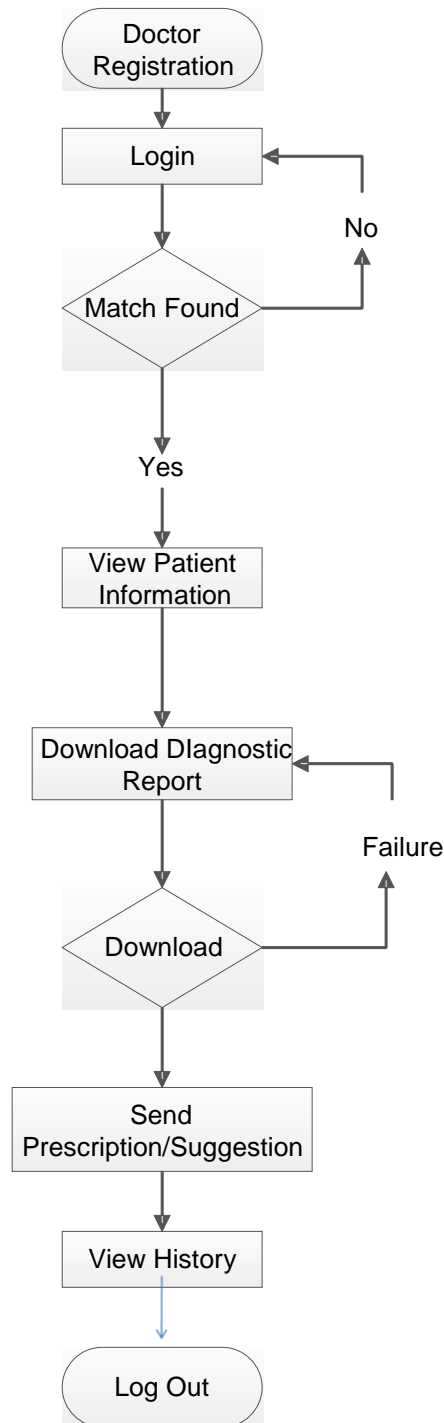


Figure 2: Flowchart of the System in Doctor's Perspective

Step By Step Implementation On Amazon Compute Cloud

1. **Step 1:** Creation of Amazon EC2 account
2. Go to the Amazon web site login to the Amazon account, if you don't have one create a new one with all the required details like home address, phone number email id etc.
3. **Step 2:** Provide the credit card details
4. We need to provide the credit card number so that the account will be confirmed with full access over the services, however they will not deduct any amount initially and Amazon ec2 works on pay-as-you-go strategy.
5. **Step 3:** Initialize connection to Amazon EC2 via Remote Desktop Connection.
6. After successful registration the Amazon ec2 will provide the link for the virtual computer through which we can proceed further with cloud services to the email id provided by us while registration.

7. **Step 4:** Establish Connection through Virtual Computer
8. While connecting to the virtual computer we need to provide the link of our virtual computer in the via Remote Desktop Connection wizard where we will be asked for the administrator permissions.
9. **Step 5:** Downloading the Required Software.
10. After successfully establishing the remote desktop connection, we will get view of the virtual computer on our desktop. Here we need to download the necessary softwares like Mozilla Firefox browser, xampp for running as local server, and MySQL Workbench for Database management and Notepad++ for editing.
11. **Step 6:** Installing the Required Software.
12. After successfully downloading the necessary softwares like Mozilla Firefox browser, xampp for running as local server, and MySQL Workbench for Database management and Notepad++ for editing we need to install them respectively.
13. **Step 7:** Copy the required files from the PC onto the Virtual Computer.
14. After successfully installing the softwares we need to copy the required files to the Virtual Desktop with the specified path like copy the "tele_medi" folder to the htdocs folder present in the xampp folder of the Virtual Computer. And copy the database files.
15. **Step 8:** Setup Database
16. After successfully copying the database files onto the Virtual Computer, setup the database connection with specific connection name, user name and password in the MySQL Workbench 5.2. And import the required database files to obtain the required connection successfully.
17. **Step 9:** Run the Website Application on Local host.
18. After successful xampp server and MySQL database setup run the website folder on the local host. if the website homepage is displayed on screen and successfully interacts with user without any errors, then it is successful.
19. **Step 10:** Run the Website Application on the Internet

Now the website Tele-Medi should run successfully on the Internet. The main draw of this application as well as the total telemedicine is in case of emergency situation it is not at all possible to solve the patient problem through telemedicine. Always the emergency patient need to bring to the nearest hospital with the help of ambulance and direct check is required.

IV. CONCLUSIONS

By our application we are trying to save the patients health conditions not only in urban places but also in rural places so that they can save time, money and not only can get timely health advices which is most important. Some people self medicate themselves because of lack of time to go to hospital which will make them fall in more trouble. Our project aims at patients who take self medications which is very dangerous because only the doctors know what treatment to be taken at any point of time..

REFERENCES

- [1] Guillen, Edward, et al. "Analysis of security requirements in telemedicine networks." *Proceedings of the International Conference on Security and Management (SAM)*. The Steering Committee of The World Congress in Computer Science, Computer Engineering and Applied Computing (WorldComp), 2011.
- [2] Caffery, Liam J., and Anthony C. Smith. "A literature review of email-based telemedicine." *Stud Health Technol Inform* 161 (2010): 20-34..
- [3] Shaikh, Asadullah, Muhammad Misbahuddin, and Muniba Shoukat Memon. "A system design for a telemedicine health care system." *International Multi Topic Conference*. Springer, Berlin, Heidelberg, 2008.
- [4] <http://www.ncbi.nlm.nih.gov/pubmed/21191155>
- [5] <http://www.embs.org/about-biomedical-engineering/our-areas-of-research/telemedicine>