

# Review on Mobile Apps for Digitized Diagnosis with TMAS-A Telemedical Aided System

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**ABSTRACT**--The tremendous changes in the technology are making the medical field to evolve on the daily basis. To be made available for the remote consumers there are lot of opportunities created due to the advent of eHealth services and equipment. One of the fast emerging section of the health care which is gaining enormous attention is Telemedicine. As specialists routinely look for better approaches to treat individuals, technology has carried various extraordinary advances to the medicinal field. There are different mobile apps available to make telemedicine possible. This paper mainly focuses on the review of the apps in different domains of telemedicine. Finally, the paper discusses a proposed architecture which is a amalgamation of different areas like IoT, Data Analytics, Cloud Storage, Artificial Intelligence to give the best of their features and finally the emergence of TMAS -Telemedicine Aided System.

**Keywords**---Digitized Diagnosis, Aided System, Review on Mobile

## I. INTRODUCTION

India has an abundance of medicinal expertise, yet it additionally probably the biggest nation on the planet regarding both region and populace. Telemedicine is the remote conveyance of health care services like, healthcare consultations or assessments over telecommunications framework. There are many apps that are available to support this telemedicine infrastructure which are allowing the healthcare providers to evaluate, diagnose and treat patients without the need for an in-person visit. This study presents a systematic literature review that contains a comprehensive overview of telemedicine, different apps available for health care, features of the apps has been presented. Trends in telemedicine using the advanced technologies and a proposed architecture which would take telemedicine to the next level are also discussed.

## II. TELEMEDICINE

The adoption of technologies that bring people and facilitators together is the major necessitate of Telemedicine. Specialists in the field can successfully offer their services to patients living hundreds, if not thousands, of kilometers away. Research says that 70% of the outpatients need not be physically present in front of doctor to get accurate diagnosis. This makes telemedicine more efficient.

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Telemedicine was for treating patients situated in remote zones, who are deprived of the healthcare facilities, or in areas with a deficiency of medicinal experts. In the present interconnected world, telemedicine is currently an instrument for convenient medicinal care—its utilization is never again constrained to overcoming the distance barriers or improving access to therapeutic care. Telemedicine simplifies the interaction between doctor and patient, it brings doctors and patients together, Reduced medical costs provide value to the patient, Extended access to consultations with specialist doctors.

mHealth is on the rise where the practice of medicine and the public health is supported by mobiles. According to Zion Market Research, global telemedicine market revenue will grow to 38 billion USD by 2022. Trends always change, and developers should constantly monitor these changes to make their apps stay relevant.

Statistics project that there will be tremendous increase in the telemedicine users. Therefore, it becomes important for the doctors and physicians to incorporate telemedicine into their daily practice.[1]

### III. CURRENT STATE OF TELEMEDICINE

The below figure depicts the evolution of telemedicine with respect to the technology usage and its current state[2]

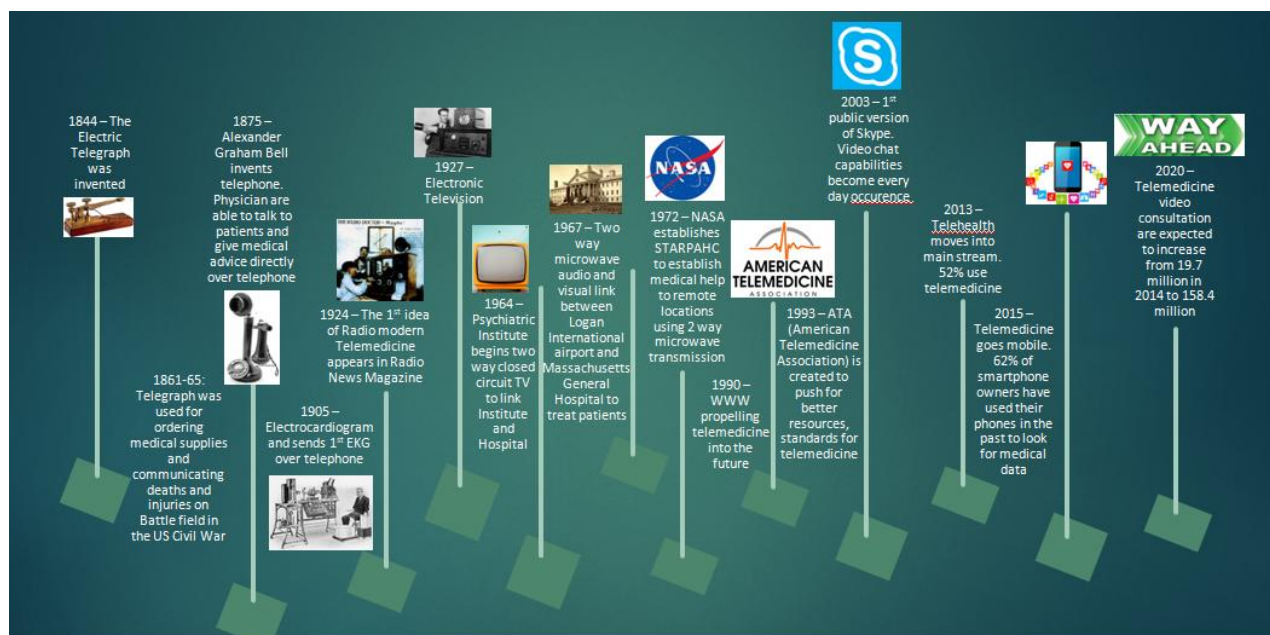


Figure 1: Technology usage and its current state

There is tremendous usage of smart phones by both health care professionals and the general public. The Smartphone is another innovation that facilitates both communication and computation in a handheld-sized gadget, encouraging portable computing at the point of care[4].

The usage of smart phones in medical domain is gradually increasing day by day. Smart phones are becoming very useful due to the enormous amount of medical applications that are available. They are helpful to do evidence based medicine along with medical communication. They can also assist in patient education, disease self-management, and remote monitoring of patients

The healthcare framework is profoundly versatile in nature, including various clinical areas, for example, centers, inpatient wards, emergency wings, operation theaters, outpatient services, intensive care units (ICUs), labs, and so forth . All things considered, working in the medicinal services framework requires extensive mobility of all those who are involved in it. Healthcare professionals mainly used pagers for mobile communication, then they started using PDA. The era of smartphones is going on. As there is increased adoption of smart phones by many involved in health care its opening doors for improved clinical correspondence, and access to information systems and clinical instruments at the purpose of care, or from anyplace whenever.

Many software applications have been developed for healthcare professionals in order to facilitate the practice of evidence-based medicine (EBM) at the point of care.

These application(apps in short) guides in Mobile Diagnosis. With a developing number of doctors utilizing smartphones and tablets consistently, a portable first methodology is being actualized utilizing mobile apps, presently advancing from fixed monitors and communication.

#### **IV. ADVENT OF APPS AND THEIR APPLICATION TO HEALTH CARE**

Apps have become a significant component of Smartphone and tablet PC use since their development in 2008. Millions of apps have been developed. The two biggest application stores by a long shot, Google Play and the Apple App Store, both offered over a million applications each by mid-2014 (1.3 million for Google and 1.2 million for Apple) (Statista 2014). A major contribution is given by Medical and health apps. Over 100,000 medicinal and wellbeing applications for mobile devices have been recorded in the Apple App Store and Google Play (Jahns 2014).

During the forecast period, the worldwide mHealth market is anticipated to reach USD 90.49 Billion by 2022 at a CAGR of 33.7%. The development of the mHealth Solutions market can be ascribed to the penetration of smart gadgets, expanding use of connected devices for remote observing and mHealth applications in dealing with chronic diseases.

Medical apps are becoming the important tools in medical domain. They assist in various features like diagnosis of disease, maintaining patients health, educate the patients with health tips, direct communication with patients. Smart phones will act like a stethoscope for a doctor.

In fact, “the Global Telemedicine Market has been estimated at USD 14.4 billion in 2015 and is projected to reach USD 34.0 billion by 2020” [1]. More and more people have the ability to reach healthcare professionals through the use of an easily accessible telemedicine app.

Rise in cost of healthcare, rise in the chronic diseases, lack of infrastructure in hospitals have attributed to the growth of the telemedicine.

### ***Telemedicine -mobile apps:***

As many people are interested in accessible healthcare telemedicine is becoming one of the health care trend. The following are some of the medical mobile apps under different categories.

### **Disease Diagnosis:**

In order to diagnose the disease there are different applications that are existing.

***Johns Hopkins Antibiotic Guide:*** This application gives up to date information on the diseases and contains lot of medical literature

***WebMD:*** It does tasks from checking the symptoms to finding the nearby specialist

***5-minute infectious diseases consult:*** Gives the good information on the specialist dealing with contagious diseases.

## **V. DRUG REFERENCE APPLICATION**

***Drugs Dictionary Offline:*** It provides A to Z information about drugs used in medicine. ***Drugs@FDAExpress:*** It provides information about FDA approved brand and generic prescriptions.

***DrugHub:*** It guides the patient all about the medication that needs to be taken.

## **VI. MEDICAL CALCULATOR APPLICATION**

***MDCalc:*** It provides decision support for clinicians in various aspects.

***UBurnLite:*** It guides the specialist in giving the burn percentage and gives background calculations to provide fast burn care.

***Pedi Quick Cal:*** It advises the patient of drug dosage and formulation.

There are many applications like Literature Search apps Clinical Communication applications which include mVisum, Amcom Mobile Connect etc, HIS Client Applications which includes MEDITECH, Patient Keeper which maintains patient related information. General Educational applications like iSurgery Notebook, Netters atlas of human Anatomy which maintains varied sources of information about anatomy of the body. There are many applications available to facilitate telemedicine

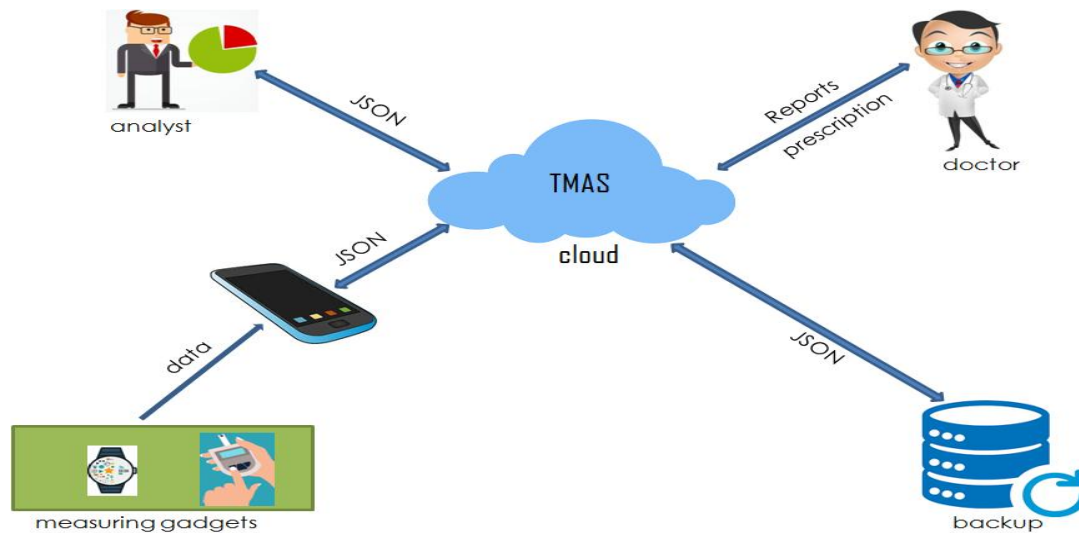


Figure 2: TMAS

## VII. ARCHITECTURE OF PROPOSED SYSTEM-TMAS

*The proposed architecture for TMAS- A telemedical aided system has the following components*

1. **A cloud component:** It acts as a data warehouse for the storage and transfer of data from one component to another.
2. **Measuring devices, wearable computing and IoT:** Tracking the vitals of the patient and getting it connected to directly to the specialist capturing their attention. It's made possible through IoT and Artificial intelligence
3. **Data Analytics:** the patients data stored in the cloud is being analyzed to provide better healthcare. Predicting the future health symptoms, better treatment and better diagnosis.
4. **Data Visualization:** Doctors can get the clear picture of what's going inside the patient along with statistics and comparative analysis can be reached out to best monitor the health of patient

## **VIII. TRENDS IN TELEMEDICINE:AI, DATA ANALYTICS AND IOT TO TAKE TELEMEDICINE TO THE NEXT LEVEL.**

### ***Patient Data Collection and Data Analytics:***

The first step to be addressed in the TMAS architecture is the source of information. The primary source of information is being digitized rather than physical reports which were being used in the previous days. Now, sensors, mobile apps and telemedical devices[5] are becoming the primary sources to automatically capture the patient related data. Due to these gadgets patients self checking has been on the tremendous rise. The tracked data is directly uploaded to the TMAS cloud. So the data analyst can find invaluable amount of information regarding the patient at TMAS cloud

## **IX. BIG DATA ANALYTICS**

The data available at the cloud needs to be analyzed by the analyst to get useful insights. The EHR technology can be encoded and made it into readable form using Big Data. Big data encodes HER into readable form, also helps doctors to get more appropriate diagnosis about patient health. The data will be safe and secure than in the physical format. On seeing the data in the cloud the specialist can make various comparative studies of the patients previous and the current status and provide them the live diagnosis

## **X. ARTIFICIAL INTELLIGENCE (AI)**

The AI part is also useful for the analysis part as it allows the developer to add new features and improve existing features. It can help the specialist to take better decisions. The usage of chatbots, speech recognition technology, natural language processing and machine learning platforms makes the specialist more intuitive and strengthens the doctor patient relationship. AI technologies can sometimes replace the doctor at preliminary stages like when consultation is required.

***Mobility and Cloud Access:*** The cloud in TMAS provides online access to all the different stakeholders in the healthcare. They can be available 24/7 without human intervention. This, in turn, decreases paper usage and saves time. Cloud data warehouses are one way of storing the data securely and efficiently.

## **XI. INTERNET OF THINGS**

Smartphone cameras, Otoscopes, Digital stethoscopes, Ophthalmoscopes, Wearable biosensors Vital sign monitoring devices etc. are some of the devices which can communicate with the other devices in the TMAS network and track the complete health of the patient from diagnosis to treatment can be made possible with the help of Internet of Things technology.

## XII. CONCLUSION

The TMAS architecture can be implemented to make telemedicine in a more effective manner. The advanced technologies like block chain can be included to ensure security. Data decentralization helps to decrease the chances of unauthorized alteration of patient information. The apps which we have discussed can be improved and we can expect more personalized telemedicine apps for doctors and patients. This is driving us to mHealth [6]. Telemedical services is providing cost effective treatments and saving lot of time for patients and physicians. The major factors that drive telemedicine are increased occurrence of chronic diseases, technology advancements and the aging population. Using such architectures like TMAS, telemedicine is likely to be more prominent in healthcare, with more patients than ever having access to top-quality medical care at their fingertips. Experts in the medical fields, and technological experts have to collaborate and do multi disciplinary research and for a better healthy society.

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