

Tele-Consulting Through Rural Health Centres for All Community – A Case Study from Nizamabad

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Abstract— Access to quality healthcare is rights of every individual, however, a large part of rural population in India do not have access to same. This is particularly acute among the all community who are a marginalized section of the society. This paper is based on the case study of community in Nizamabad District of Telangana. A tele-consulting system through rural health centre is proposed in this paper. The field implementation of this system is currently underway at Telangana mission in Nizamabad.

Keywords- Rural healthcare, Tele-consulting, Rural areas

I. INTRODUCTION

Healthcare is a right of every individual but lack of quality infrastructure, dearth of qualified medical functionaries, and non-access to basic medicines and medical facilities thwarts its reach to 60% of population in India. Around 700 million people live in rural areas where the condition of medical facilities is deplorable. Though a lot of policies and programs are being run by the Government, the success and effectiveness of these programs is questionable due to gaps in implementation. In rural India, where the number of Primary Health Care centers (PHCs) is limited, 8% of the centers do not have doctors or medical staff, 39% do not have lab technicians and 18% PHCs do not even have a pharmacist. India also accounts for the largest number of maternity deaths. 31% of the population travels more than 30 kms to seek healthcare in rural India. About 30% of people in rural India did not opt for treatment because of financial constraints. Around 39 million Indians are pushed to poverty because of ill-health every year [1].

This national level situation is closely reflected in the Nizamabad district of Telangana as well. Close to 35.4% of population in Nizamabad all community. There habitations are in remote inaccessible regions. The health situation among this community is more acute owing to the infrastructural difficulties. National Rural Health Mission (NRHM) identified 8 such areas in Nizamabad. Our project implementation is at one such location called Armur coming under the Pakkom PHC.

In order to improve this healthcare system in Nizamabad specifically amidst the inaccessible all community regions, we propose a tele-consulting system in this paper. The field implementation of the system is currently underway. The preliminary results from the study are shared in this paper.

II. RURAL HEALTHCARE SYSTEM IN INDIA

The rural healthcare infrastructure in India is a three tier system as shown in Figure 1. This system is developed on the basis of populations norms provided in Table 1. As on March, 2011, there are 148124 Sub Centers, 23887 Primary Health Centers (PHCs) and 4809 Community Health Centers (CHCs) functioning in the country [1].

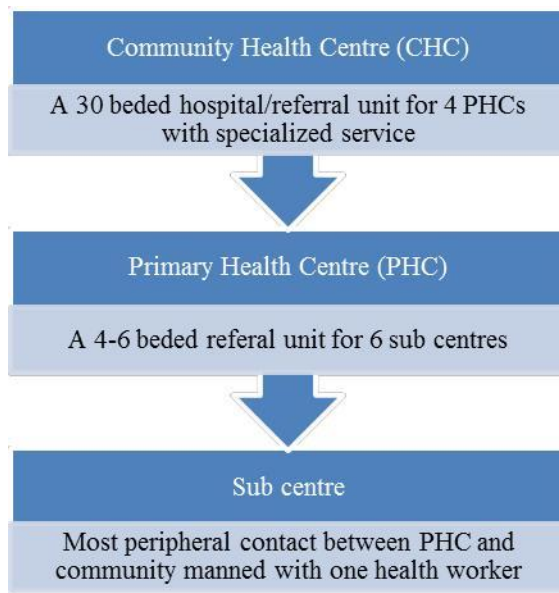


Figure 1. Three-tier rural health infrastructure in India

Centre	Population norms (No. of People)	
	Plain area	Rural area
Sub Centre	6000	4000
PHC	25000	20000
CHC	110000	85000

Table 1. Population norms for the three-tier system

According to the National Rural Health Mission (NRHM) report, 700 million people live in 636000 Indian Villages. Majority of people die due to preventable and curable diseases like diarrhea, measles and typhoid [1]. The key factors that are inhibiting rural healthcare delivery in India include:

- Not attractive enough for private sector considering the distributed population and lack of purchasing power of the customers.
- Less efficient public sector initiatives.
- Inefficient distribution networks and lack of skilled staff.

About 31% of the population travels more than 30 kms to seek healthcare in rural India. Due to this inaccessibility to public health care and low quality of health care services, a majority of people in India turn to the local private health sector. Around 92 percent of

healthcare visits are to private providers of which 70 percent is urban population [2]. The rural population is however not in a position to afford this expensive health service. Around 39 million Indians are pushed to poverty because of rural-health every year. We developed this project idea with an aim of making a difference to this alarming reality.

III. BACKGROUND OF THE PROJECT

Before you begin to format your paper, first write and save the content as a separate text file. Keep your text Nizamabad, one of the most backward districts of Telangana, is one among the 90 backward districts in India. According to census report, Nizamabad is primarily a rural district; 96.2% of the total population lives in villages. Armur (district headquarters), Kamareddy and Banskada are the three major business towns of the district. There is a substantial concentration of minority (mainly Muslims and Christians) population.

Another important demographic feature of the district is the presence of about 17.4 per cent of tribal population. This is highest among all districts in Telangana. Schedule Cast populations in the district are found in remote and inaccessible areas. They are dependent on labour in agriculture, plantation work and forestry for survival. Many of the tribal regions are inaccessible due to infrastructural constraints. This situation becomes more acute during the rainy season [5].

A. Health Situation in Nizamabad.

As mentioned earlier, Nizamabad is one of the most backward districts in Telangana. The district lags behind all India figures in 3 out of the 8 socio-economic indicators. Against all India figures of 87.9 percent households having access to safe-drinking water, only 56.3 percent of the households have access to the same in Nizamabad [5]. This is leading to a number of water borne diseases in this district. The health infrastructure in the district is not uniformly distributed. 67% of the villages have a hospital or dispensary. However, the health facilities in tribal inhabited areas are poor owing to difficulty in reaching the locations [5].

In Nizamabad district, 17.43 % of the total population comprises of tribes and the problem of alcohol dependence is prevalent among them. Alcohol dependence and tobacco consumption are leading to numerous social problems such as violence, suicide, health hazards, and economic problems amongst this population. The geographical situation provides a favorable atmosphere for the production and sale of illicit liquor. The excise and police officials find it difficult to reach the locations in time to take legal actions due to infrastructural difficulties. Illiteracy and unemployment add to the severity of the problem.

According to a recent report [3], NRHM has identified 8 locations as difficult to reach within the district [3: pg – 182]. One of these eight areas called community under the Pakkom PHC is target location of the current study. Owing to the difficulty in reaching the site, health services offered in the area are poor. The detailed description of the site is provided in the next section.

B. Description of the site for initial field implementation.

The initial field implementation of the project is planned in the Telangana mission. This Telangana mission is situated 12 kms inside the forest from mallaram. The only means of reaching this Telangana mission field is by crossing the Godavari River. There are no proper means of water transportation available to cross this river. For implementation of the project, we are working in collaboration with an evangelist at this Telangana mission. Social work, de-addiction, tuition centers, running health camps etc. are the

main current activities of this Telangana mission. Currently the Bhukya Madhu Research Scholar, Osmania University and Bukya Ravi support this mission field.

C. Field Study Observations

Before starting off with this project, we did a field study to understand the requirements of the people in the area. One of the concerns expressed by the people was the difficulty in reaching the PHC at Pakkom owing to poor transport facilities. The prevalence of fake doctors and unhygienic medicinal practices was also there. Alcohol consumption and drug addiction was high in the area. The general health and socio-economic standard were below the average norms.

IV. PROPOSED SYSTEM

Given the limited healthcare support provided to the all community at Armur, we developed a tele-consulting system with support from the Telangana mission. The proposed system is developed to give the all community people better access to health care. There is a remote health centre equipped with essential diagnostic tools (for temperature, blood, blood pressure, ECG, urine, etc.). The health centre can work in collaboration with PHC/sub centre or work as a separate entity. This remote health centre is manned by health workers. The patient comes to the centre and a health worker at the centre does a preliminary check-up and basic health details are collected. Then the patient is directed to a tele or video conference room so that patient can talk with a doctor. The doctor then provides appropriate prescriptions to the patients or refers him for further check-up and treatment.

Additionally, the system has a cloud-based Electronic Health Record System which maintains the history of the patient which can be used for future reference. On receiving a call from a patient, the doctor can find patient's previous records through the patient's ID number. A past record contains previous prescribed medicine and the doctor can easily ask the status of follow-up actions to the patients. This saves doctor time and also the cost burden on the patient will be reduced. It also provides a good psychological feel to the patient and enhances the trust in the doctor. This is particularly important because of two reasons. First, because the system operates remotely, people are generally unwilling to have faith in such a system. This feeling was expressed in the initial field study we did with the stakeholders. Second, it was important to overcome the past unpleasant experiences that people had in dealing with fake doctors.

In this specific location where the field implementation is underway, internet facilities are available. The doctor can monitor the patients live ECG, ophthalmic image, Heart Beat Rhythm etc. through the devices that has been configured through the system so the doctor can diagnose more effectively. However, because of the erratic nature of internet facility during rainy season, the initial implementation is restricted to an audio based tele-consulting. The detailed working of the system is described in the next section. In addition, this system offers some value added services to patients such as SMS alerts to remind them about taking medicines, customized health tips, reminders for next visit to the health centre, advertisement of medicines, advertisements of various treatment facilities available hospitals. Though the revenue generation mechanism of advertisements we intent to develop a system that is self-sustainable in the long run. The overall system architecture is shown in Figure 2.

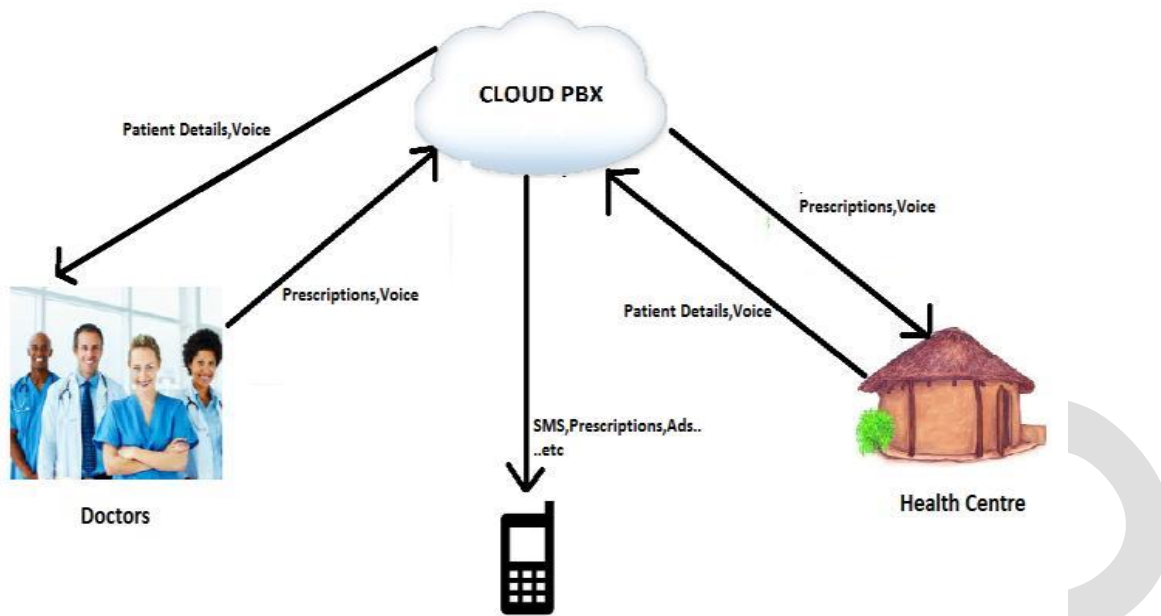


Figure 2. System architecture

V. WORKING OF THE SYSTEM

Step 1

A patient comes to the centre, the health agent will ask the basic details and it is entered into a software interface. Each patient is given unique id. The health agent will also check the vital signs and readings are entered.

Step 2

The patient is then directed to an audio conferencing room so that he/she can talk with a remote doctor. The audio call is routed through a cloud PBX (Private Branch Exchange) so that customized IVR prompts and bulk SMS services all can be integrated into the system.

Step 3

Doctors have a software interface where the basic details entered by the health agent are displayed on doctor's laptop or is available in the form of SMS on the doctor's mobile phone.

Diagnosis phase: The patient explains the symptom and then the doctor queries the patient based on the symptoms to find out the cause of the symptom.

Advice phase: The doctor then either prescribes medicine (over the counter medicine only because of the medical policy issue), or suggests a nearby hospital for further check-up and consultancy. The doctor enters his prescription through the application and sends to the remote clinic where the health agent can take a printout and give it to patients. In case of absence of internet connection the

same can be done through SMS.

Step 4

Audio conversation and patient history is saved for future requirements.

VI. PRELIMINARY RESULTS

Once the patient arrives at the rural health centre the health assistant will do a preliminary checkup. This checkup is necessary to get the vital signs of the patients which in turn help in the consultation. For the preliminary checkup we are using several portable systems that are available in the market and those which were developed during our earlier studies [6]. The system is cost effective and portable for such telemedicine centers. The instrumentation we use for monitoring different parameters and the preliminary results are detailed below.

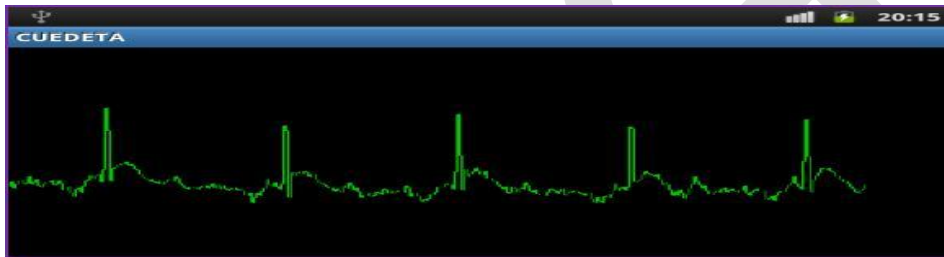


Figure 3. Live ECG monitoring

A. ECG Monitoring

ECG Monitoring can be done using the system called CUEDETA which is a real time heart monitoring system in android OS. This mobile cardiac monitoring incorporates a design of an integrated electrocardiogram (ECG) beat detector, supported by the PDA version of Personal Health Information Management System (PHIMS) and Facilitated Accurate Referral Management System (FARMS) through wireless network. This system is designed to be used for continuous monitoring of the patients at different environments such as home, hospital, work place, and practically anywhere [6]. Figure 3 shows the live monitoring of ECG Signals in the CUEDETA system.

B. Collecting blood pressure, blood sugar and blood oxygen level

For this we can integrate several portable handheld devices. These devices are supported by bluetooth which enables easy transmission of data to the central database. For the preliminary study, we have used one touch ultra 2 glucometer for measuring the blood glucose; A&D UA-76 PBT blood pressure meter to check the blood pressure, blood oxygen level; and pulse can be checked using the oximeter.

C. Software system

The software interface can be used to enter the details obtained from the patient. The details are also saved helping in future treatment. This software is currently developed in android and the PC version of the software is under development. The health workers in the facility have to enter the patient details like vital signs through the software interface, so that before teleconsulting the doctor will get a background idea of the patient. A sample of the data collected from the study is provided in Table 2.

Name	Pressure (Sys/Dia)	Blood Glucose Level(mg/dL)	SpO2 %	Pulse (bpm)	Temp (°F)
Roshan	120/70	110	98	80	98
Jibu	140/90	140	97	68	100
Cyril	110/70	100	99	90	99
Ajay	150/90	170	98	75	98

Table 2. Sample data collected

VII. CONCLUSION

Health consultancy through mobile phones is getting population across the Bottom of Pyramid (BoP) markets. Popular services include Gram Health, Gram Vaani [2] and others. Our project is a step in the direction of providing healthcare facilities to remote rural areas through tele-consulting. Our project specifically focuses on the tribal population which is a marginalized section of society in India.

Future development of this project involves the implementation of a video-based consulting. For this, the internet infrastructure in the area needs to be developed. For this, we aim to incorporate specific applications aimed at providing internet facility in rural India like N-Logue. N-Logue offers internet and voice services through its wireless access system called Correct. This system offers 35/70 kbps internet access. This service is already offered successfully in the states of Maharashtra, Gujarat and Tamil Nadu [4].

This project also offers immense possibilities of big data analytics on health parameters in India. Currently a large portion of rural health records are maintained in hard copies that are likely to get damaged or lost. Our system offers the possibility of digitization of entire medical records of patients leading to possibilities of predictive analysis. If the proposed system is implemented in the large scale, the immense volume of data developed could be used for predicting outbreak of epidemics and other diseases. Such predictions can help the health department to take preventive steps before the actual outbreak.

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