



Health Care Reaching Rural India –A Technological Change Management Process

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Abstract: The sole objective of technological advancements in the healthcare is for enhancing the availability of improved medical services at reduced costs to the rural India. Technology in health care sector in the last 30 years has changed a lot and these changes are very well incorporated and managed keeping in mind the remote rural societies living in the farthest corners of the nation. The technological innovations in the healthcare sector and ICT (Information and communication technology) with continuous improvement in both would prove to be a boon for millions of citizens living in rural India. However, these changes in the technology should be properly managed with series of its implementations to provide better rural health care services to the villagers. This paper presents a new e-Health model framework which will use the cloud technology to share and access the remote patient's data as well as providing the villagers medical care and services which is the right of every citizen.

Keywords: Cloud computing, e-health model rural health care, ICT.

I. INTRODUCTION

Healthcare is the right of every individual but due to the many reasons the delivery of health services has been limited to urban India. Few of the reasons are:

.Poor health care infrastructure attributed to lack of investment,

- Gross inefficiency in healthcare sector,
- Absenteeism of trained medical professionals
- Lack of technology and telecom network facility.

Due to such reasons, the delivery of health services has been limited to urban India. According to the census 2011, rural India counts 83.3(Crores) villagers, which is 68.84% of the total population of the country [1], where the condition of the health care and medical facilities is deplorable. In rural India there is a shortage of Primary Healthcare Centers (PHCs). According to [2] reports 8% of the centers do not have doctors or a medical staff, 39% do not have lab technician and 18% PHCs do not even have a pharmacist. Considering this big picture there is dire need of the new innovation in technology to provide better health care to rural India. Information and communication technology can be effectively implemented to improve the rural health care system.

The condition of the health care in rural India in the past decade has changed due to the revolution and progress happened in the field of the health care technology. However due to lack of proper execution, the advancement in health care services has restricted its reach into the rural India. To improve the rural health care condition and to expand the reach of the health care technology in rural India, lot of initiatives have been taken by government, private organizations, as well as public-private partnerships, but due to insufficiency of present rural health care structure these technologies have not yet penetrated deep down to mass population living in the villages of India. Finance Minister Arun Jaitley reported the monetary allowance for 2015-2016 in which he assigned the budget amount of Rs.33, 152 crores for healthcare sector [3]. He pointed out the present and upcoming health projects with unique features to enhance the public health care sector.

Some of the latest technologies in rural health care services are Electronic Medical Record, Electronic Health Record, e-Health Centers, and Telemedicine and so on, these advancements, if appropriately executed can make substantial changes in individual's life of rural India.

Change Management is a structured approach which can be define as "how an organization tackle with the changes which is happening at both the individual level and at the organization level and how and organization react to change". For any Organization who wants to be successful it must effectively adapt to the changes in the organization and same goes with the health care sector.

Section II covers the literature review which is divided in three parts, first one is methodology, second is existing rural health care system (RHCS), and the third one is emerging technologies in rural health care with case studies of existing systems, section III covers proposed rural healthcare model and its architecture and description and section IV covers the conclusion of the paper.

II. LITERATURE REVIEW

A. Methodology

In this paper, we have tried to study many articles, white papers, research papers published in different magazines, journals and conferences. Review of these readings brought up the real bad picture of healthcare in rural India. We would consider it as our secondary data as for the primary data, we collected the first hand information from the sufferer i.e. patients from villages sitting in the metro hospitals, waiting in long queues for their treatments. For this primary data we have conducted surveys in St. Stephens's hospital, Delhi and KMC Hospital, Udupi, Karnataka and some of the neighboring villages in Gurugon to see the condition, issue and problems of the village patient. The reason behind conducting surveys is to find out the gaps in the current health care system and methodologies.

The questions which were asked during surveys are:

Q1: Name and age of the patient, place from where the villager belongs and his/her health issue?

Q2: When the patient got to know about the disease from which he/she was suffering and what are the medical facilities they have been provided at this hospital.

Q3: What are the facilities of health care at their local hospitals, if any? Is there any primary health care center or a clinic facility available in their villages?

Q4. IF PHCs available, what are the OPD timings?

Q5. Is doctor available in said timings?

Q6. Are the Clinics/PHCs private?

Q7. Are the Clinics/PHCs, if available are set by state government or any NGOS?

Q8. How much distance they have to travel for reaching to PHCs/clinics, if available?

Q9. Do they have commuting facilities like local bus/riksha etc. to reach to the PHCs/Clinic?

Q10. Do Doctors visit to their homes in villages to check the patient in case of emergency?

Q11. If any other issues, Please tell?

Q12. If any suggestions to improve the healthcare facility for you, please suggest?

These questions were asked in Hindi, English and Kannada but for publishing in paper we are submitting in English only.

B. Rural Health Care System (RHCS)

The Rural health care system in India is developed as three tier system [4]:

1) Sub-centers: Sub-center is the most peripheral and foremost contact point between the essential health care system and community. Each Sub- Centers consist of one nurse and one male health worker. Sub-centers are assigned tasks relating to identifying with interpersonal communication so as to bring the behavioral change and provide services in relation to maternal and child health care, family welfare, and nutrition, immunization, diarrhea control and control of communicable diseases programmes. As on 31st March, 2014, there are 152326 Sub Centers, 25020 Primary Health Centers (PHCs) and 5363 Community Health Centers (CHCs) functioning in the country.

2) Primary Health Centers (PHCs)

PHC is the first contact point between villages

community and medical officers. The PHCs were visualized to provide curative and preventive health care to rural India. There were 25,020 PHCs functioning in the country as on 31st March 2014.

3) Community Health Centers (CHCs)

CHCs are being built and kept up by the State government under MNP/BMS program. CHC is required to keep an eye on four medical specialists i.e. specialist, doctor, gynecologist and pediatrician bolstered by 21 paramedical and other staff. . It serves as a referral place for 4 PHCs furthermore gives offices to obstetric consideration and authority counsels. As on 31st March, 2014, there were 5,363 CHCs working in the nation.

C. Emerging Technologies in Rural health

1) Tele-health: Tele-health is of a doctor talking to a patient by videoconference located in a remote area. Doctor can counsel the patient and patient can impart their medical history to the doctor. Tele-health technologies include:

- Video-Conferencing
- Storing patient data, medical records, images and videos.
- Remote patient monitoring and live monitoring
- M-Health (Mobile Health) applications.

Electronic Intensive Care unit Telemonitoring (e-ICU): The eICU framework permits ICU medical nurse to stay at the bedside when their patients are in emergency or deteriorating. There's a component in every ICU room that permits the attendant to call the eICU office with a doorbell-sort catch, instead of needing to leave the space to call a doctor or force an alternate attendant from a room adjacent to decide. Once the eICU center gets that call, the group can turn on a one-way camera and two-way sound framework to see and hear what's going

ahead in the room, and if required the bed side nurse can identify the issue and call for a doctor. Fortis healthcare is the first hospital in India to implement these systems. This system is already in use, monitoring 34 ICU beds in two small hospitals based in Raipur and Dehradun.

2) Cloud Computing: Cloud computing [6] is of great importance for rural health care because the information can be shared and accessed all over the world and around the globe. With cloud computing in rural India, local health workers can visit villages, input the patient data, diagnose history, test and report into the system which will automatically be stored in the data in cloud, from where expert professional or doctor can access the data, monitor the patient health information and keep live tracking of patient.

3) m-health (mobile health) technology: Mobile technology is changing more rapidly than any other innovation all around the globe. The count of Mobile user in India stands second on the planet after china, and more than two third of mobile user uses internet in their smartphone. As indicated by Trai (telephone administrative and power of India) India has approximately 922.4 million mobile users by January 31 2014[5].

M-health is utilizing cell phones and PDA for giving health care services in remote territories. Mobile technology advancements or m-health application are helpful in rural India for remote patient checking, remote information gathering and treatment support.

III. Case studies of Existing technologies in rural health Care:

1) HP E-health Center: In December 2012 Hewlett-Packard (HP)[7] and the government of India's Council for Scientific and Industrial Research (CSIR) formed a partnership to develop the eHealth Center (eHC), a cloud-empowered social health care Infrastructure that can be quickly taken off to give moderate essential care alongside tele-health benefits in remote areas. The eHealth Centers come completely equipped with key diagnostic devices and equipment and HP workstations, open electronic medical records (EMR) frameworks and HP cloud-empowered innovation like HP health cloud, dashboard and videoconferencing features. This technique permits local staff at e-health center to perform diagnostic tests and send results to specialists around the globe for remote diagnosis, off-site services that would not otherwise be affordable and available.

2) Swasthya Slate: In mid-2012[8], biomedical designer Kanav Kahol and his group his team headed to Muktsar, a locale in southwest Punjab, by most accounts 400 kms north of Delhi where the earlier year, 8 ladies have died of eclampsia (representing 15% of maternal deaths in the country). They conveyed backpack containing a telemedicine gadget, which Kahol had made six months before. The Swasthya Slate (SS)[9] health tablet is a promising diagnostic tool made by the Public Health Foundation of India. This innovation coordinates diagnostic data collection, electronic patient records (EMRs) and information sharing through cloud computing to enhance medicinal services and patient care in rural India. This device can perform 33 distinct medical tests. These tests are cheap and accompany more than 95% precision. On broad appropriation, Swasthya Slate can save lives that would some way or another be lost because of late diagnosis or absence of access to human services.

3) Graam vaani: Gram Vaani started in 2009[10], it has manufactured creative voice applications for associations working in health care sector to mechanize and deal with their procedures effectively. Our vAutomate suite of advances gives host of services, including the accompanying following innovations that can be utilized for better rural health care. The vast of ambit of mobile based solutions offers to extension the crevices in health awareness operations in bunch ways. Intelligent Voice Response Systems (IVRS) on cellular telephones gives a large group of administrations to achieve a millions while breaking the hindrance of lack of education and advanced gap. Services on mobile like Mobile- health, Mobile- study, Mobile- learning, Mobile-following and so forth to robotize procedures guarantees snappy and high caliber out-comes

4) Electronic Medical record System: An EMR is an advance form of a paper diagram in a clinician's office. It contains the [11] medicinal and treatment history of the patient data. An EMR permits a clinician to effortlessly track the information over the long run, and to recognize which patients are expected for safeguard screenings, check how patients are getting along on specific parameters, for example, pulse readings or vaccines and screen and enhance general nature of consideration inside the practice. An EMR [12] is said to make the procedure of patient record-keeping less demanding, more exact and comprehensive and more effective. Doctor's uses specific software, which permits them to enter data electronically and makes understanding history easy and accessibility, is instant.

IV. Proposed e-Health Model

The e-health model is a bottom- up approach and consists of five components. The architecture of proposed e-health model in (Fig 1) is explained:

a) Villages: Villages here refers to the remote areas where basic medical care and facilities are not present.

b) Gram Taluka/Sabha: Gram Taluka consists of minimum of 10 villages. It serves as an administrative Center to all the villages under it.

c) LRU (Local Representative Unit): LRU will be a small hospital or clinic which consist of a resident doctor, nurse, local health worker, tier1 data entry operator, and tier2 IT specialist. Villagers will come directly to LRU

for primary medical treatment. Tier1 data entry operator task is to note down the details of the patient including name, age, health issue, test results etc. and after collecting all these details, the next task will be to provide the patient the basic medical care and attention. After the treatment if the patient medical condition is good and do not need any further medical care, then tier 1 data entry operator will upload the information to the cloud. Once the information is uploaded to the cloud, an electronic smart health card will be issued to the patient for future reference and in case if the patient visits LRU again then with the help of smart health card doctors will be able to see the medical history of the same patient and can review it and can diagnose the patient and add the new medical information. If the condition of the patient is critical and needed the advice from the expert doctor's then tier1 operator will contact tier 2 IT specialists in LRU. The tier2 IT specialists will then connect the patient and doctor to the RRU through videoconferencing or e-ICU technique.

d) RRU (Regional Representative Unit): RRU will be a regional hospital which consists of expert doctors and IT expert. RRU once establishes the connection with the LRU through videoconferencing, will provide the help or suggestion to the local doctor to treat the patient in the best possible way. If patient condition is seriously critical and expert doctor suggests for the operation and surgeries etc., which cannot be done at the LRU, then in that case RRU will send the ambulance to the LRU to bring the patient to the RRU to perform the operation or surgery. The expert doctors if requires some advice on the condition of the patient from metro hospital will then try to communicate with them.

e) Metro Hospitals: Metro hospitals are the bigger and the best hospital present in the country like AIIMS, Apollo, and Fortis etc. and have the best of facilities to operate and treat the patient. Metro hospitals will provide necessary advice and help to the RRU doctors and if requires will ask doctors to send patient to their hospitals for better medical care.

Metro hospital will then give a ticket acknowledgement to the RRU for that patient and it will save the hassle of sitting in large ques for N number of days

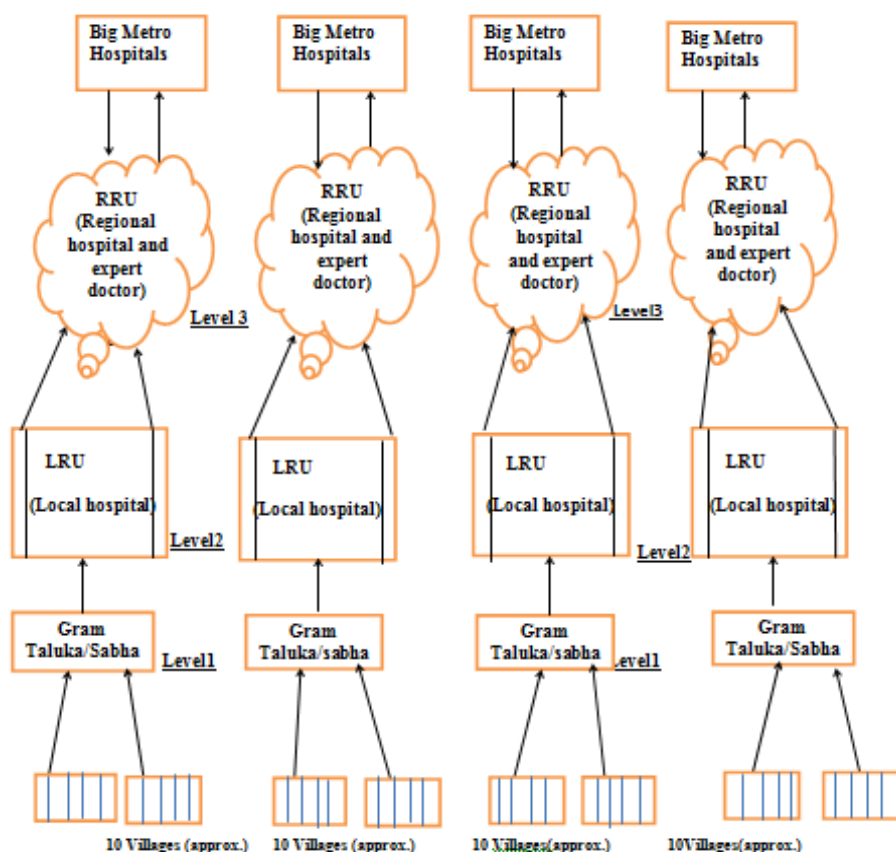


Fig. 1. Architecture of proposed e-Health Model

V. Conclusion

The proposed e-Health model will eliminate the gap between the doctor and the village patient for better healthcare services. Provided qualified and trained doctors, medical experts and financial resources to set up the proposed e health model, with co-operative support from both private and public bodies and agencies, healthcare will reach rural India. This technological change management process will compiled as e-Health model in our paper will take basic to advanced medical faculties to each home of rural India.

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