
Telemedicine for Indian primary health centres: is there a need for super specialist consultation

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Abstract: Although Indian healthcare is booming it faces huge challenges in the area of rural healthcare delivery. Both public and private healthcare providers have been trying different models to reach out to the rural areas for providing primary healthcare and one of the major initiatives in this direction has been telehealth. Though there were few successful models, telehealth initiatives in general faced many challenges from inadequate infrastructure, unskilled paramedics and a lack of sustainable economic and business model. This paper analyses a private healthcare providers experience in conducting 16,609 teleconsultations across rural India using Cisco's health presence and focuses on identifying specialists need in the rural area and methods to address those needs in an India specific context.

Keywords: telemedicine; telehealth; specialists; telecardiology; teleradiology.

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Biographical notes: Sunita Maheshwari, awarded 2014's 'Amazing Indian' by Times Now, is a US Board Certified Pediatric Cardiologist who did her training at Osmania Medical College and then at Yale University in the USA. She was the winner of the Young Clinician Award from the American Heart Association and the Best Teacher Award at Yale University. She was the Head of Department at Narayana Hrudayalaya for a decade. She has over 200 scientific lectures and 60 scientific publications to her credit and was the Editor of the *Pediatric Cardiac Society of India Newsletter*. She currently runs the first of its kind innovative e-teaching programme, accredited by DNB, for postgraduates in pediatric cardiology all across India. She was nominated one of the top 20 women achievers in medicine in India in 2009. Apart from her medical clinical work she is a medical entrepreneur and she has cofounded three companies – Teleradiology Solutions, Telrad Tech and RXDX Multispecialty Clinics.

Arjun Kalyanpur is Chief Radiologist and CEO of Teleradiology Solutions, a healthcare company headquartered in Bangalore and focused on telemedicine/teleradiology services and technology. He was trained at AIIMS, New Delhi, Cornell University Medical Center and Yale University in the USA. He is a visiting faculty in the Department of Diagnostic Radiology at Yale University. He is an active member of the Radiologic Society of North America and the Indian Radiology and Imaging Association and is a reviewer for the journals *Emergency Radiology*, *Acta Radiologica* and the *Indian Journal of Radiology and Imaging*. He has published extensively in the radiology literature and was named one of the 50 pathfinders in healthcare in India by *Express Healthcare Magazine*.

Chhavi Mehra is an Internal Medicine Doctor practising at RXDX Multispeciality Centre in Whitefield, Bangalore. She is also the Head of the Department of Quality at Telerad RxDx. She was trained at UCSF California and practiced there for ten years before moving back to India. She has been involved in teleconsultations to the rural interior areas of Madhya Pradesh and Karnataka where no doctor can reach but technology can.

Srikrishna Seshadri is an experienced healthcare professional working extensively on telemedicine implementation in the rural parts of India and Africa. His primary area of work includes teleradiology, telecardiology and telepathology i.e., most areas of telehealth.

Sheeba Thomas is currently working as Medical and TeleMedicine Consultant at Telerad RxDx in Whitefield, Bangalore. She completed her MBBS from Al-Ameen Medical College, Bijapur, India, and residency from Medical College, Trivandrum, India. In her 15 years of experience, she has worked in various hospitals in India and abroad handling emergency services and critical care, medical counselling and nutrition, telemedicine and family health checkups.

1 Background

Telemedicine has been becoming popular for super specialist and specialist consultations. In a country such as India, where access to primary care physicians in rural India is limited, telemedicine could be a useful solution. India's significant economic growth can be further augmented if the healthcare needs of its population are addressed. The current economic loss due to the lost disability adjusted life years (DALY) is estimated at > 200 million life years in India and disease incidence is expected to double by 2015 (World Health Organization – Western Pacific and Southeast Asia, 2008). Considering the present population and per-capita GDP [*GDP Per Capita (Current US\$)*], the increase in economic loss of productive life years in this period translates to \$200 trillion in India alone.

The spread of available workforce is also disproportionate across various regions. Estimates show that almost 60% of health workers live in urban areas, which account for 26% of the country's population. Health worker density in urban areas at 42 per 10,000 is nearly four times higher than rural areas which have only 11.8 workers for a similar size of population (Rao, <http://uhc-india.org>). Growth rate of human resources and hospitals

significantly lags the disease incidence rate, and hence the gap in demand versus supply is widening at an alarming pace.

In contrast to the bleak scenario in healthcare, computer literacy is developing quickly in India. Healthcare providers are now looking at telemedicine as their newly found avatar. Theoretically, it is far easier to set up an excellent telecommunication infrastructure in suburban and rural India than to place hundreds of medical specialists in these places (Dasgupta and Deb, 2008). In the past telemedicine was purely an audiovisual link. However, the telemedicine technologies of today have incorporated several digital devices. In such a situation, how often are specialists really needed and is a general physician (GP) adequate for telemedicine coverage were the questions we aimed to answer.

2 Materials and methods

Over a three year period, Teleradiology Solutions and its multispeciality clinic RXDX in Bangalore, Karnataka were connected to 18 primary health centres (PHC's) in Madhya Pradesh and Karnataka via Cisco's health presence telemedicine solution. The aim was to provide basic healthcare and second opinion for patients visiting the PHC's. In addition the technology was used for patient education activities.

Our telemedicine model focuses on providing both primary care consultation and specialist consultation to patients depending on the need. When the patients visit the telemedicine centre at the PHC, the coordinator at the patient pod sends an appointment request to the GP in Bangalore. The appointment contains details about the patient. The telemedicine kit at the patient pod is integrated with hardware which can acquire vital signs (digital blood pressure, oxygen saturation, digital thermometer) and an ECG. With a digital stethoscope auscultation is possible in addition to a live audio-visual consultation. Started with only one PHC in Gillesugur, North Karnataka and about 70 patients per month in March 2011, a total of more than 19,000 consultations have been done at 18 PHCs under this programme by the end of August 2013. We analysed the available patient data for which teleconsultation was performed from our telemedicine centre to assess the need for specialist consultation.

3 Results

We analysed 16,609 patients, whose data was available, for whom teleconsultation was performed from our telemedicine centre by the GP. The distribution of the cases as per the geography of the PHC's is shown in Figure 1. Of these, 1,619 (10%) of the patients required specialists referrals. Interestingly, 90% of the patients could be evaluated, diagnosed and treated by the GP alone (Figure 2).

From the overall referrals, cardiology was on the top ($n = 442$; 27% of all specialist referrals), followed by ophthalmology ($n = 286$, 17%), surgery ($n = 185$, 11%) and obstetrics and gynecology ($n = 145$, 9%) specialists for further follow-up (Figure 3). Our GP consulted 971 (6% of all patients seen) patients for dermatology related problems, who were prescribed treatment by the GP's themselves. Analysed data was used to understand the specialists need in the served population and also to understand the additional equipment requirement for specialist consultation.

Figure 1 Teleconsultations geographic distribution (see online version for colours)

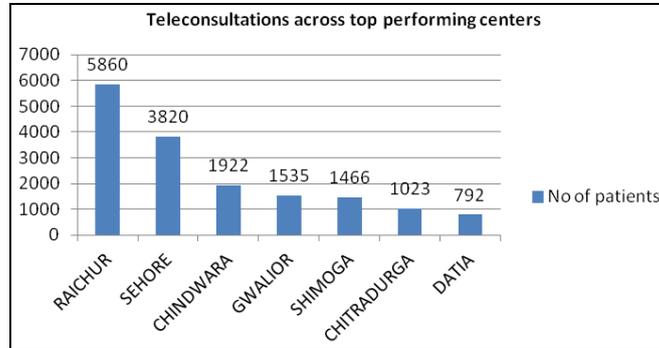


Figure 2 Distribution of cases which did and did not need specialists consultation (see online version for colours)

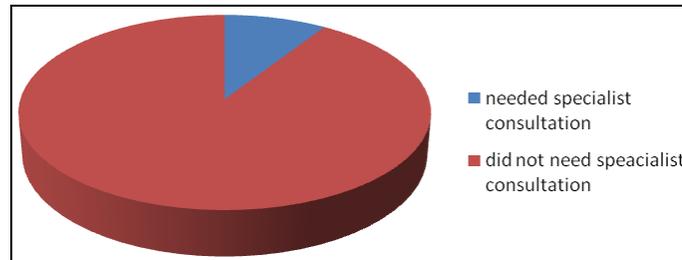
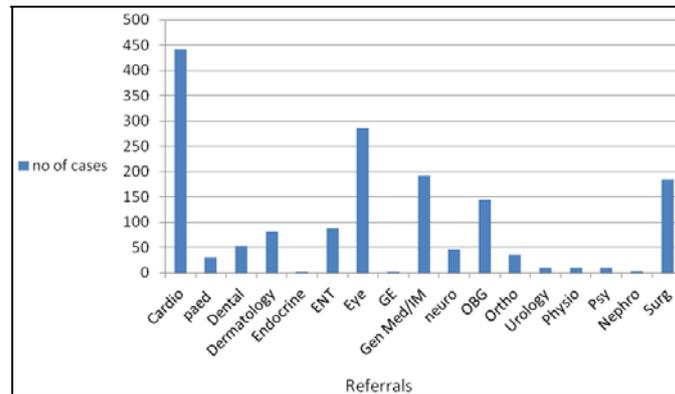


Figure 3 Distribution of cases which needed specialists consultations (see online version for colours)



4 Discussion

Telemedicine is not an evolutionary concept but a revolutionary concept and at the heart of every revolution, there is the need for a sudden massive change, at the core of which is the human mind (Saxena and Singh, ‘E-medicine in India – hurdles and future

prospects'). Telecommunication use in medicine has been long debated (Hjelm, 2005), but desperation breeds innovation and propels adoption. Telemedicine, at its core, links healthcare professionals and patients together using video links. What started off as a technology for consultation using simple video conferencing has now evolved to diagnosing disease, offering treatment and chronic disease management using remote telehealth and home health monitoring devices for patients sitting hundreds of miles away.

In a country like India which has just 3% of its physicians living in rural areas and 25% in semi-urban areas, telemedicine can become an effective healthcare delivery mode. As noted in our study, general illnesses and the majority of skin problems could be handled by the tele GP. Dermatology was the most common issue which would ordinarily need a specialist, however interestingly most cases could be handled by the GP themselves, rather than calling in a dermatologist.

Estimates suggest that the rural telemedicine market is potentially 800 million Indians (Mani, 2013). Even if 10% of these are enabled through telemedicine, that is 80 million consultations per year from rural India alone. The market potential for telemedicine is obviously enormous. In our study, Cardiology being among the top referred specialty reaffirms the findings of the global burden of disease studies (Murray and Lopez, 1996). Even though cardiology was the most referred to speciality, lack of an echocardiogram at the rural end made it difficult for the cardiologist to reach a definitive conclusion. Taking cue from this data, as a group working on telehealth in India, we are focusing on cardiology needs for rural patients and providing ECG, echo and other imaging reads through a technology platform CardioSpa™ to implement telemedicine on a wider scale.

Figure 4 Obstetrician teaching pregnant mothers concepts of pre and post natal care via the tele-link from Bangalore, India to remote villages in the country (see online version for colours)



Our second focus area is to build trained physician capacity at rural hospitals by providing tele-education to physicians, through our online portal RadGuru™ and via a content portal. This portal is currently used as a tool to provide continuing medical education for radiologists and cardiologists across India. The same tele teaching model was extended to the community in the PHC's where talks by the obstetrician (Figure 4) or GP were beamed to all PHC's.

One of the main goals of telemedicine in the e-health and m-health era is to make specialists available and accessible to the rural healthcare facility, both for increasing

collaboration and learning for the rural healthcare workers and reducing health inequalities due to non-availability of specialists. However, in our experience, usage of GPs helps the vast majority of patients seeking medical attention in rural India. Therefore, rather than purely focus on specialist consultations, our country would do well to focus on GP and family physician telemedicine consultations. These would be able to address 90% of the issues faced by the rural population, as demonstrated by the findings in our study.

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