ANALYSIS & RECOMMENDATIONS ON THE NATIONAL RURAL TELEMEDICINE AYUSH NETWORK (NARTAN) OUTREACH IN BIHAR

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Abstract: Bihar is one of the most impoverished states in India, ranking 17th in the HDI index of the 17 major states, largely due to the inadequate provision of health care services in villages and towns. In order to correct this problem, I worked with the Bihar Government on a rural medical outreach project which utilized Telemedicine (the use of telecommunication kiosk to diagnose and treat patients) kiosks to establish 212 primary health centers in the State. Although this project eventually treated over 250,000 people per month, its effect could have been far greater. This paper analyses the examines the different facets of this study, its benefits and its shortcomings, and provides recommendation on various aspects of project functionalities. The aims of these recommendations is to rectify the current operational difficulties faced in order to provide the maximum health care benefits to the maximum number of people in the State of Bihar.

ADITYA SINGH, 2016

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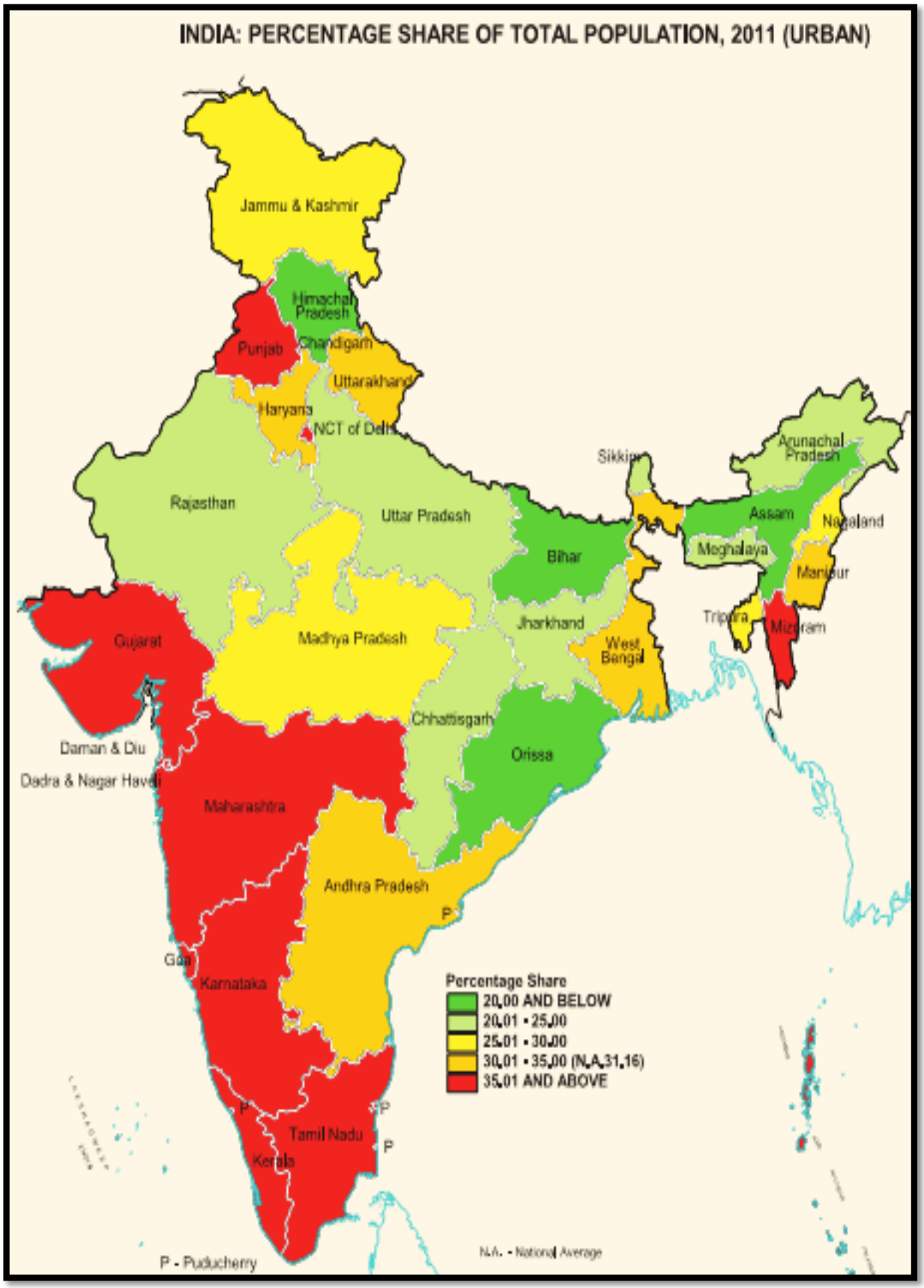

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BACKGROUND

It has always been a challenge to provide affordable healthcare for all citizens for any country especially in rural areas. This is especially true in developing countries as the maturity of medical systems and adaption of technology as multiplier is still low.

To correct this situation, the Government of India created the “National Rural Health Mission”. This project was conducted to study the impact of the NHRM and the local state government of Bihar’s initiative of “NARTAN” to solve this problem.

The current state of healthcare system in the state of Bihar requires serious attention. It is one the 18 states covered under the high focus under the NRHM policy. While there has been significant improvement under this policy with regards to development of Primary Healthcare centers, immunization, testing, treatment, and medical facilities, the health status of the state of Bihar is yet to see significant improvement with need for more medical outreach and awareness amongst the rural population.

The state has a roadmap in terms of goals to be attained in the long run. Some of these include an increase in number of healthcare professionals working at all levels within the system. The intended target is to increase the number by 3 times the current status, set up medical device manufacturing hubs over the course of next 5 years, Initiate health insurance schemes for poor communities through microfinance institutions and NGO's to cover at least 40% of the rural population over the next 5 to 6 years. There is also a plan to open multi-specialty and super-specialty hospitals in partnership with private players at 8 districts over the next 5 years.

However, the primary objective is of providing basic healthcare services to maximum number of people in the most robust and cost effective manner. To address the need of the hour, the Union Government and the State Government undertook the approach of delivering healthcare services to the rural population via the use of Telemedicine. An electronic delivery of diagnostic and healthcare services to remote rural population even in the absence of physical infrastructure was the apt approach to attain the immediate improvement in healthcare status of the population. Telemedicine helps to provide the necessary basic healthcare services in the most effective, convenient, and robust manner across a massive geographic region.

Given that majority of the state population resides in rural areas with limited access to basic healthcare services, the State Government in collaboration with the Central Ministry initiated the KSHEMA Kiosks project with the intent of setting up 212 Primary Health Centers in 36 districts and 1 Main Center to deliver healthcare services to the rural population of the state. This study was initiated to test the efficacy of the Bihar government's project of Rural Medical Outreach via Telemedicine.

From an analysis perspective, the study elaborates the rationale behind this initiative, the intended benefits, the challenges and solutions implemented during the course of setting up the project, the execution strategies, and the prospects of scaling up the initiative. The study also elaborates in detail the overall business model used to execute this project. As a part of understanding the intended impact of executing the project and the probable causes of its limited success, the study details some key points relating to the overall performance of this project.

The overall impact of this initiative is evaluated based on the increase in extent of usage by the rural population over the given time period. The access to affordable healthcare products and services to the low-income groups dominating the rural regions of the state has increased the quality of health across different regions within the state with improved health conditions amongst women in particular. A secondary impact of the initiative includes training and recruitment of local people that has led to increase in skilled labor employment and development of local entrepreneurship.

In conclusion the study presents clear recommendations covering various areas of project functionalities including, operation management, financial management, project management, and strategic planning and execution. It also recommends following best practices of similar models which was successful in India by private and public players and internationally. While these recommendations are presented in a broader context, the underlying theme is to understand the overall functioning dynamics of a project on this scale. These recommendations would enable the project to rectify its current operational issues and improve its overall performance by delivering excellent healthcare services to maximum people and improving the health status of the region.

2.0 NARTAN PROJECT

NARTAN is a national level initiative to bring primary healthcare and services to urban and rural India. AYUSH is a government initiative to deliver medicines and medical care to the needy and poor in urban and rural areas of India especially the traditional Indian Medical system - **AYUSH (Ayurveda, Yoga, Naturopathy, Unani, Siddha and Homeopathy).** To ensure effective delivery of healthcare services across the geography, Points of Presence (POP) in form of Primary Health Centres (PHC) and District Health Centres (DHC) are established as a means to increase outreach and delivery of healthcare services. To deliver these services, technology is being used in the form of Telemedicine for diagnostics and consultation purposes.

2.1 BACKGROUND OF BIHAR'S MEDICAL OUTREACH PROJECT

National level healthcare status:
About 70% of our population lives in rural India; 90% of secondary & tertiary care facilities are in the cities and towns far away from the rural India. The figure below details the concentration of urban population and the top tier cities in all states based on 2011 census. State of Bihar has below 20 percent of its population living in urban areas. This makes it critical for the government to improve delivery of healthcare services in the rural regions.

Bihar is the 3rd most populated state in India with over 90 million people. In 2014-2015, it grew at a rate of 17.9% in terms of GDP.

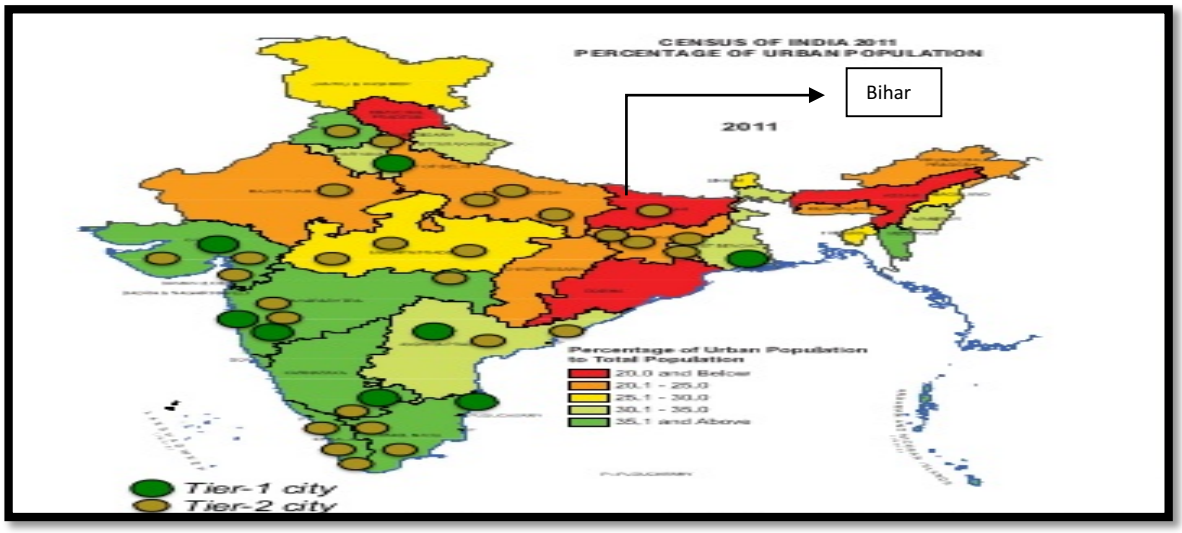


Figure 1: Urban population distribution state-wise details with top tier cities, based on 2011 census data

But, more than 80% of the people in Bihar live in rural regions and lack the access to basic health care facilities, with 31% of the rural population travelling over 30km for health care purposes. As basic health care amenities are not available in these regions, 66% of rural population does not have access to critical medicine, resulting in preventable and remediable diseases being the chief cause of death in rural Bihar.

2.2 STATUS OF HEALTHCARE IN BIHAR

Bihar is a classic case of development disparity between the rural and urban population in terms of accessibility to healthcare amenities. The access to healthcare and the quality of healthcare are key to development of health of the population in general which has a cascading effect of the workforce. According to a PWC roadmap report for better healthcare, key factors affecting healthcare in Bihar are,

- High MMR (Measles, Mumps and Rubella),
- High TFR,
- Poor Public Health System,
- Poor infection management and environment protection, etc.

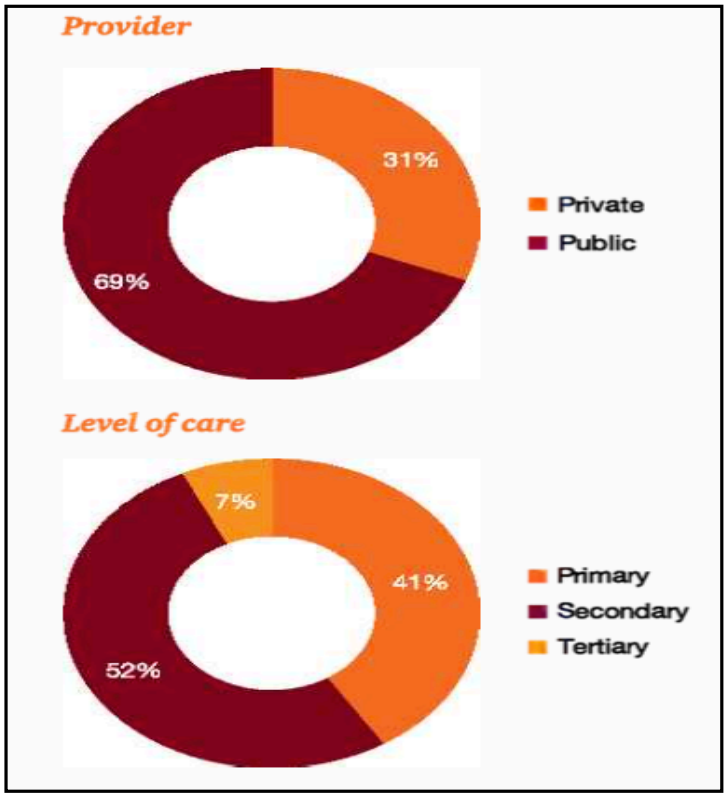


Figure 2: Details the percentage of Healthcare service providers and the level of care provided to individuals across the state - CII pwc report

The root causes of these problems were:

1. Lack of Hospitals and Doctors in Rural Areas: Most doctors are unwilling to work in rural areas due to the hardships expected. To set up hospitals in the rural areas is an expensive piece in terms of implicit and explicit costs. These areas lack basic infrastructure and amenities and are also poorly connected from a logistics perspective, making it difficult to transport building materials and equipment.

2. Inadequate infrastructure: There is a lack of mass disease surveillance and recording. Data from patients was not collected or stored properly – poor or no Electronic Medical Record (EMR) system. There were also problems linked to poor communication networks to automate or to centrally link all the EMR data.

With a rural population growth rate of 24.25% and 80% plus in rural areas, there was much cause for concern and a crying need to solve these health problems.

The table below details the overall state requirement of healthcare infrastructure for the state.

Public Health Facility	Required *	Current Status		Gap
		Sanction	Functional	
HSC: Health Sub Centre	20760	16623	9696	4137
APHC: Additional Primary Health Centre	3460	2787	1330	673
PHC: Primary Health Centre	--	534	--	--
RH or CHC: Referral Hospital or Communitay Health Centre	865	466	67	399
SDH: Sub-Divisional Hospital	63	55	38	8
DH: District/Sadar Hospital	38	36	36	2
Medical College & Hospital	21	13 [Govt-10, Private-3]	10 [Govt-7, Private-3]	8

Table 1: Healthcare Infrastructure in Bihar - Society of Health, Bihar

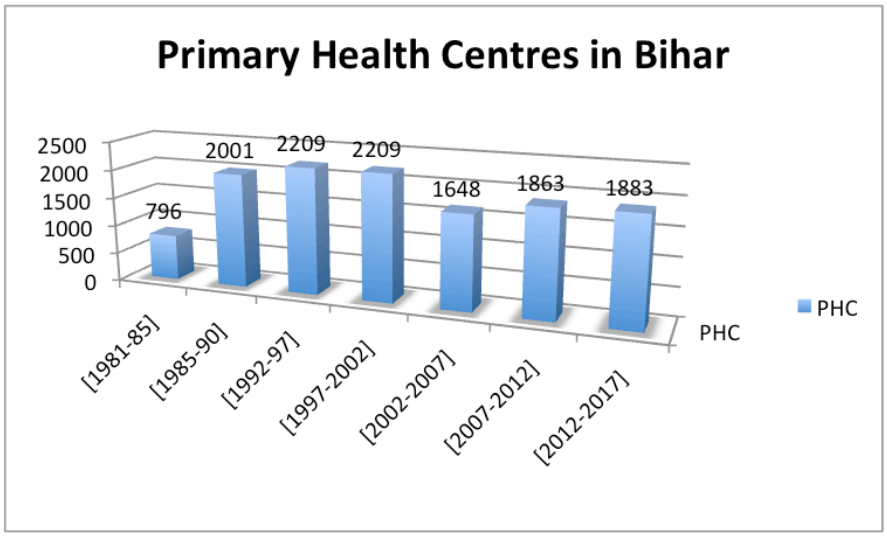


Chart 1: Primary Health Centres in Bihar, 2015, Rural Healthcare Survey 2015-16

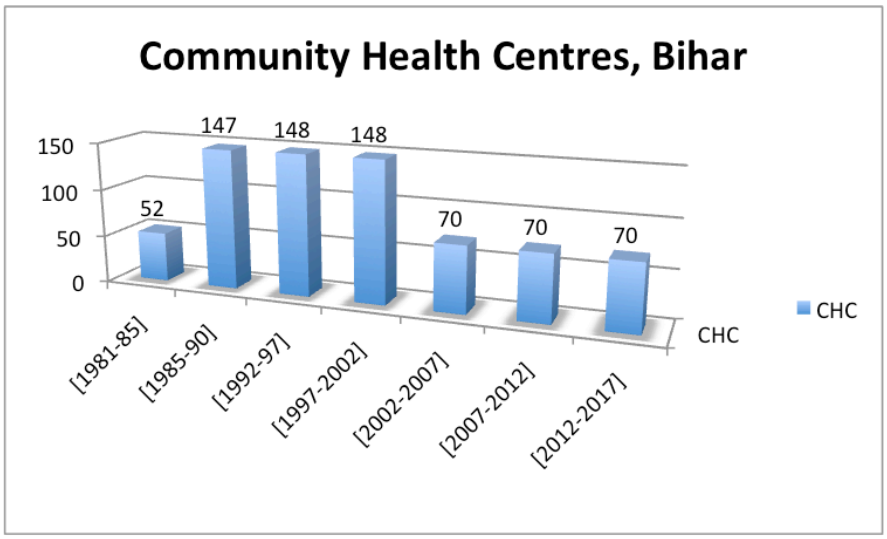


Chart 2: Community Health Centres in Bihar, 2015, Rural Healthcare Survey 2015-16

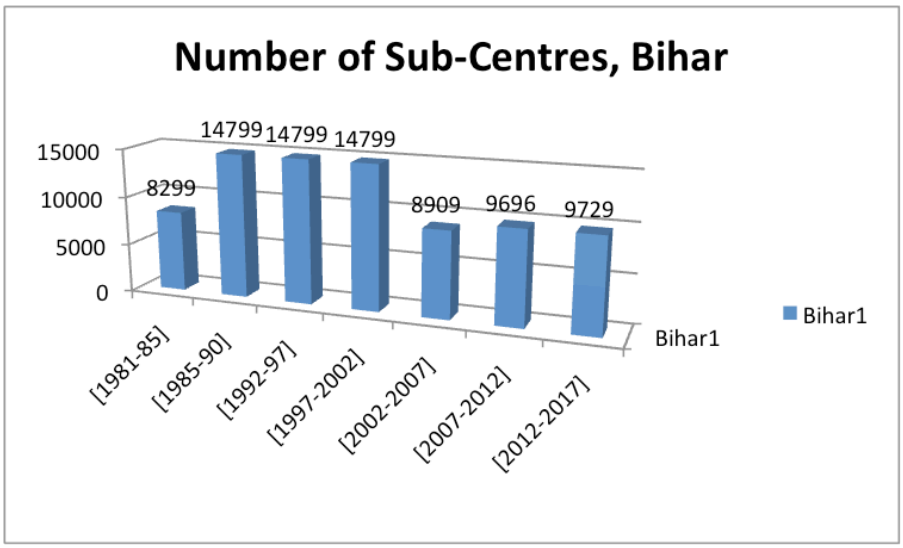


Chart 3: Functioning Sub-Centres in Bihar, 2015, Rural Healthcare Survey 2015-16

2.3 BACKGROUND OF TELEMEDICINE

To address the need of the hour, the Union Government has adopted National Rural Health Mission (NRHM) providing healthcare services for the rural population across the country.

In this context, Telemedicine, an information and communication technology based tool, has the potential to assist in electronic delivery of diagnostic and healthcare services to remote rural population even in the absence of physical infrastructure in place thus can create a platform to network India. Telemedicine helps to provide healthcare where there is none and improve healthcare where there is some.

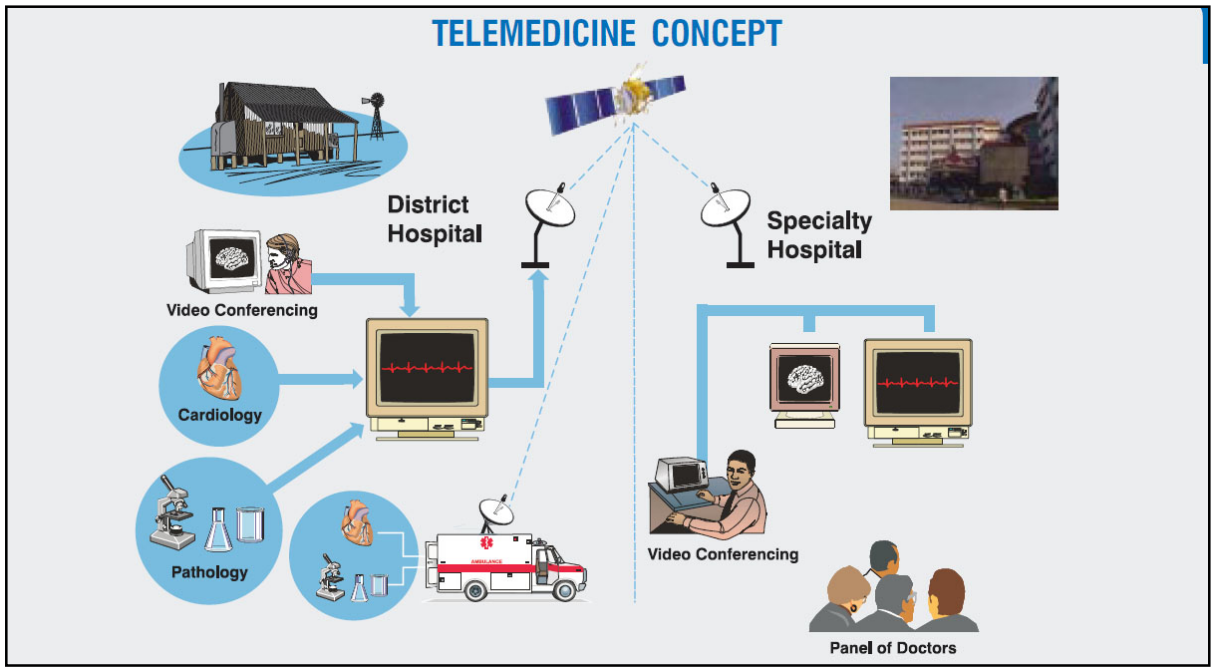


Figure 3: Concept of Telemedicine

A number of initiatives are underway in the area of telemedicine with the objective for providing quality consultation and caring for patients in areas where specialized patient care is not available. There is major support and thrust provided by DIT through projects and systems, organizations like ISRO, reputed academic medical institutions like SGPGI, AIIMS, PGIMER, AIMS, SRMC and corporate hospitals like Asia Heart Foundation, Apollo Hospitals, SGRH, Fortis, Max etc.

Backed by a strong vision to build a national Telemedicine Network in India, DIT has been involved at multiple levels – this includes Development of Technology, Initiation of pilot schemes and standardization of Telemedicine in the country.

Several state level Telemedicine network like Kerala state Telemedicine Network, Tamil Nadu state Telemedicine Network, Haryana and Punjab state Telemedicine Network, etc. are coming up with pilot projects and have shown promising results.

In addition, three state capital district level hospitals in northeastern states of India are getting connected with super- specialty hospitals, one at Kohima, Nagaland already being operational. Another one linking one each state level hospital in Sikkim and Mizoram with Indraprastha Apollo Hospital is example of Public-Private Telemedicine Network in place and under effective use.

3.0 KSHEMA KIOSKS - INITIATIVE BY BIHAR GOVERNMENT

On a state-level, the Government had set the objective of providing healthcare services to the rural population with the intent of providing affordable treatment and health checkup services, and manage outbreak of diseases by early diagnosis. To achieve this target, telemedicine was used as a platform to deliver the said services and more.

The Bihar Government via State Health Society of Bihar (SHSB) awarded to a Government body, KEONICS (Karnataka State Electronics Development Corporation Ltd) the contract to develop the “Kshema Kiosks” in Bihar.

KEONICS in turn sub-contracted it to one of its registered vendors to supply the equipment, hardware and software, create, operate and maintain these centres. A total of 212 Primary Health Centres covering 38 districts and one Central unit was envisioned.

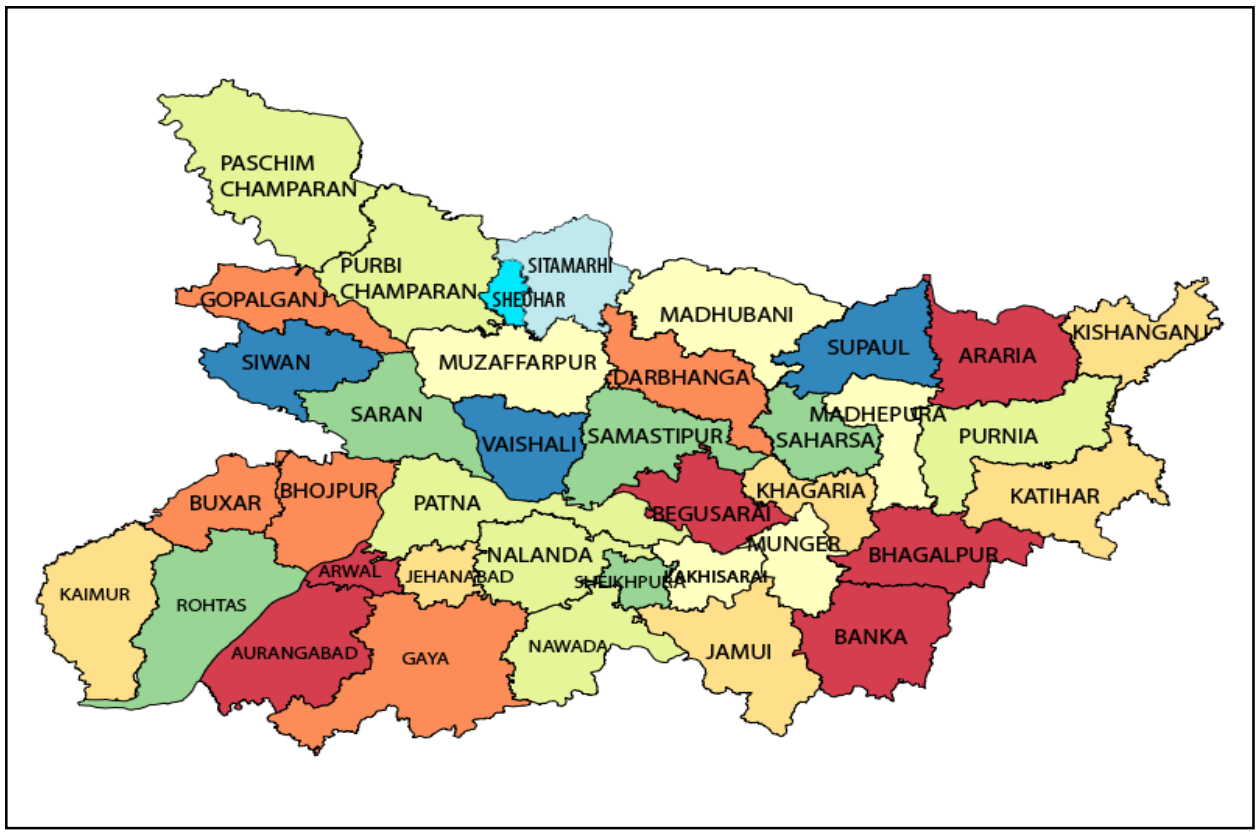


Figure 4: District Map of Bihar

3.1 RATIONALE BEHIND THIS INITIATIVE

- End-To-End workflow for Telemedicine including medical devices, EHR and application
- Integrated Solution for investigations and diagnosis
- Automated Solution for Differential Blood Count
- Video Consultation Services for remote patients with online Electronic Health Record.
- Automatic Disease Identification for Malaria, TB, Jaundice and Dengue

3.2 BENEFITS OF THIS INITIATIVE

- Timely access to diagnostic, specialty healthcare advice at the grass root level through the low cost telemedicine network centering around the district hospital as the service provider
- Improvement on knowledge base of the rural population (to empower the rural folks on self healthcare – disease prevention & health promotion)
- Remote education, training / retraining and skill development of grass root healthcare workers and professionals
- Ensuring public health related data (as has been incorporated under NRHM) harvest, compilation, storage at district hub, archive and distribution across network to facilitate electronic governance of NRHM.

3.3 CHALLENGES AND SOLUTIONS

- Non-availability of required infrastructure at the PHC's: Escalate to Authorities at regular Interval.
- Resistance to accept Telemedicine system by the hospital staff / Doctors: Educate with materials.
- Challenges in getting space and difficulty liaising: Convince about benefits of the system.
- Non availability of required human resource during the deployment: Trained Local Resources

3.4 EXECUTION STRATEGY

- Proven concept and working model for telemedicine solution for any state of India.
- Component based solution for extensibility of Integrated Modules such as EHR, Disease Surveillance.
- Integration of EHR, IDSP, Workflow, and Knowledge Management Modules in one Kiosk.
- Very affordable as it involves frugal innovation

3.5 PROSPECTS OF SCALABILITY, INCLUSION OF SERVICES

- Robust architecture for scaling the solution from 250 hospitals -1000+ hospitals infrastructure.
- Unified healthcare system harnessing both communication and computing for the rural populace.
- Designed to diagnose, Record details with enhanced seamless transfer of data migration.
- Expandable Disease Identification aside from the primary set of diseases including, Kala Azar, Chikungunya etc.
- Conceptualized on clinical components to offer advanced diagnostic capabilities.

4.0 PROJECT BUSINESS MODEL

4.1 RESPONSIBILITIES OF THE STATE HEALTH BODY (SHSB):

For this project, the responsibilities of the SHSB included:

- Provide the land and building for the kiosks rent free and facilitate adequate drinking water, electricity, water and sanitation and Broadband Connectivity across all locations.
- Pay for the cost of medical multi-diagnostic equipment.
- Provide at each location, up to 2 rooms of sufficient size for Tele-consultation along with lock and key arrangements.
- Pay an agreed sum per month per fully operational kiosk.
- Ensure utilization of services via local radio, television, and other publicizing media on a monthly basis about the services.

4.2 RESPONSIBILITIES OF VENDOR:

The responsibilities of KEONICS which were to be implemented via its vendor by a Service Level Agreement (SLA) included:

- Running and Maintaining the Centres at agreed operational level, including recruitment, training of staff and equipment maintenance.
- All the diagnosis to be paid by cash and accounted for and submitted as per agreed
- Revenue to go to SHSB on a sharing basis after deduction of costs of Medical Kits/ Consumables and Private Health Service provider fees. This profit to be shared in a 50:50 ratio.

HEALTHCARE KIOSK HARDWARE	TELE MEDICINE HARDWARE
Intel Embedded Processor (Dual Core)	Microscope with Digital Camera
Keyboard / Mouse / Web-Cam	Vital Signs Monitor
USB Interface	ECG Machine with USB Interface
GSM –GPRS	Urine Analyzer
Thermal Printer	Digital Stethoscope
Powered by Solar Panel & UPS	

Table 2: KSHEMA Kiosks Technical details

- All medical diagnostic services to be provided to the needy patients at the rate agreed upon as per the government approved rate card.

- Provide consultation services to the people of Bihar as per the approved and agreed rate card.
- Pay for staff and consumables.

4.3 RATE CARD FOR THE FIRST YEAR

The rates were 20% to 50% of prevailing diagnostic rates for the mentioned tests in the locations, apart from the ease of getting the reports and consultation immediately.

Sr. No	Particulars	Cost inclusive of tax
1	E.C.G	50.00
2	Rapid Test (Blood smear, sputum smear and urine sample)	
	Blood Smear for TLC/DLC & ESR,HB%	40.00
	Sputum Smear for TB test	40.00
	Blood Sugar Test	30.00
	Urine Sample Test	30.00
3	Vitals Test Except for E.C.G	20.00
4	Railways/ Examinations Results/ Competitive Exams/Job Vacany/ Government Schemes	5.00
5	Earnings through Referral Service charges	20% of private provider fee or fee agreed upon.
6	Private Health Provider Charges	As per agreement with 2nd party & private provider with consent of SHSB

Table 3: Rate Card detailing the particulars and the cost associated with the test

It was also the responsibility of KEONICS's Vendor to establish a central command centre with PHCs and DHCs nodes in form of Kshema Kiosks, supply and installation of medical equipment and accessories at all the locations with the required interiors such as furniture, beds and fixtures.

Moreover, KEONICS also had to employ 250 technical staff for 212 PHCs, 36 District Hospitals, and 2 district centres in the 38 districts of Bihar, as well as 1 managerial and 12 technical staff at the command/state unit. This included recruiting, selecting and training these staff members with the skills required as well training medical doctors and pharmacists to operate and manage NARTAN by maintaining their biometric attendance.

The government of Bihar supported operations by paying for the establishment of a command unit, 212 PHCs and 36 District Hospitals and 2 District Centres, and a fixed amount per month for the running and maintenance of each unit.

A fixed payment per centre per month was dependent on performance, namely,

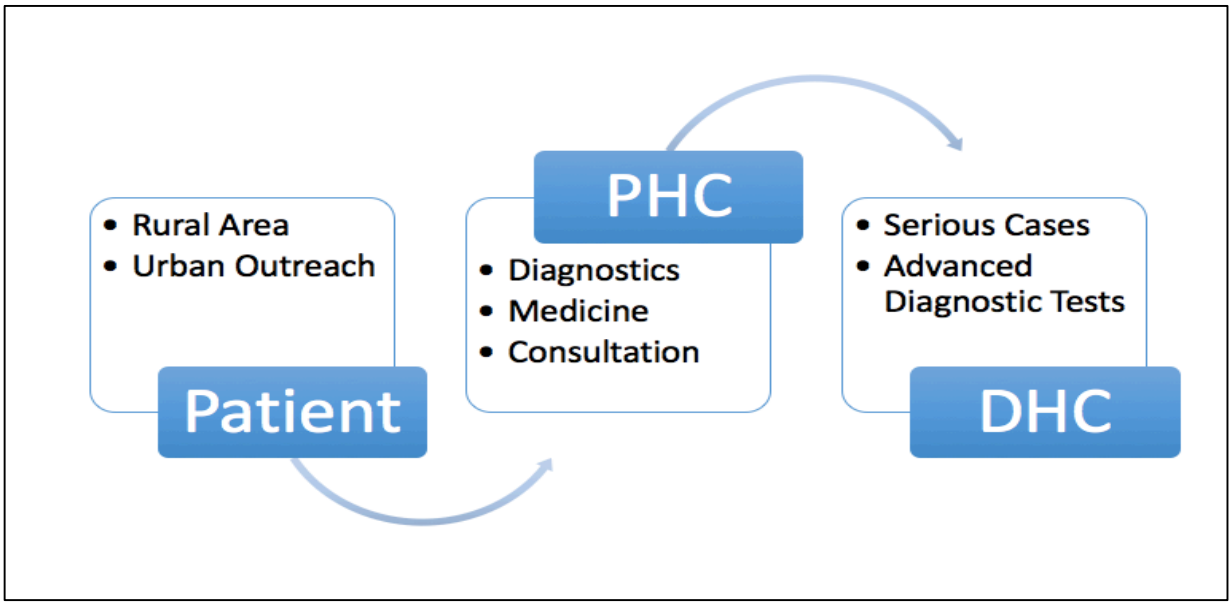
- A minimum of 15 services had to be provided in eight hours and that the deployment of full man power, as per agreements, is achieved. A work report has to be submitted on a daily basis to SHSB with node wise detailed reports to be submitted on a monthly basis.
- The final performance is calculated on the personnel attendance, achievement of 15 services in 8 eight hours, and customer satisfaction levels.
- If a score of more than 90% was achieved, the node will receive 100% service charge; a score of 80-90% will receive 90% charge and a score of 70-79% will receive a penalty of 0.5% every month in the form of additional cost cover.

Thus, the government provided a fair and transparent SLA for KEONICS's vendor to perform, gain rewards and do a larger social good by making the initiative a success.

5.0 IMPACT ON PATIENTS

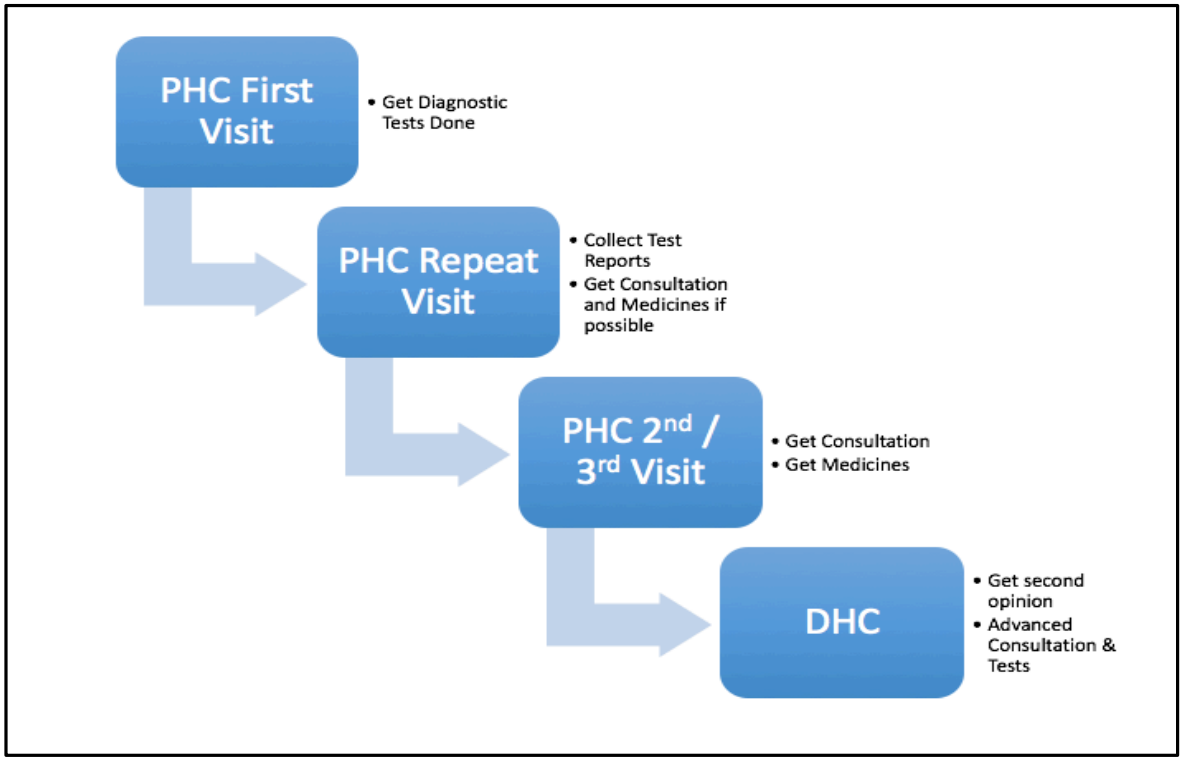
The patient benefitted greatly from NARTAN as shared below.

5.1 TREATMENT DURING EARLIER TIMES

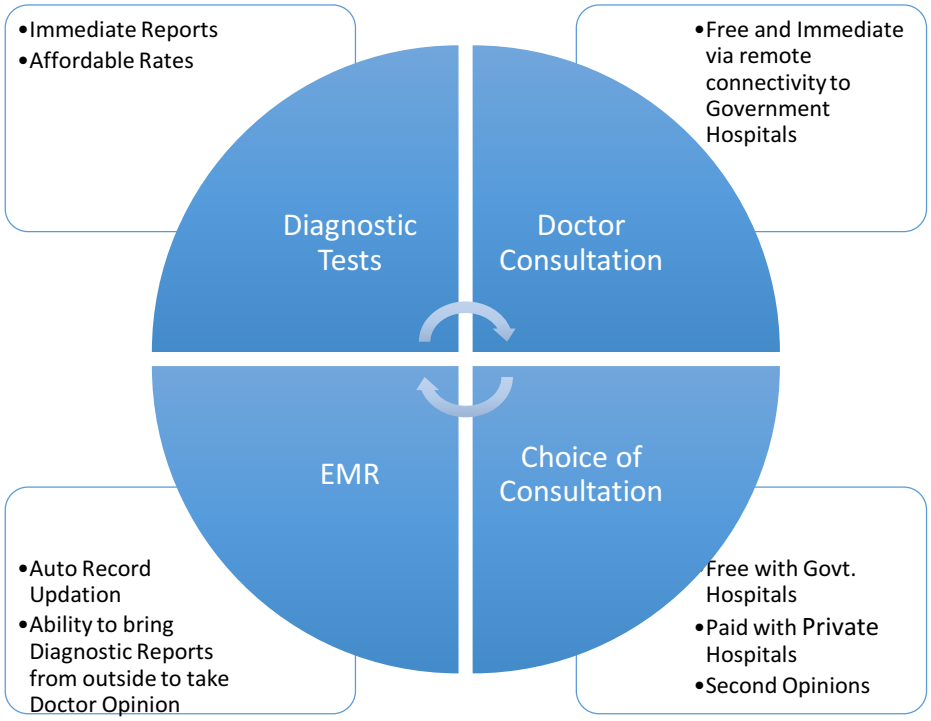


This was the process before the introduction of the kiosks. The patient living in the rural / urban outreach had to travel to a PHC or the nearest diagnostic centre for a diagnosis, whose report he would receive a few days later. Then he would again have to travel to receive these reports and give them to a doctor for the right advice and medicines incurring a substantial cost both in economic terms vis a vis travelling and in terms of opportunity cost in terms of time wasted.

This ordeal is clearly shown in the following schematic diagram.



5.2 STATUS AFTER KSHEMA KIOSKS



Now due to Kshema Kiosks, patients are saved time and money as tests and diagnosis is available at a nearby kiosk and if they feel the need to get a second opinion, then they go to DHC also by remote connectivity from the Kiosk using web camera.

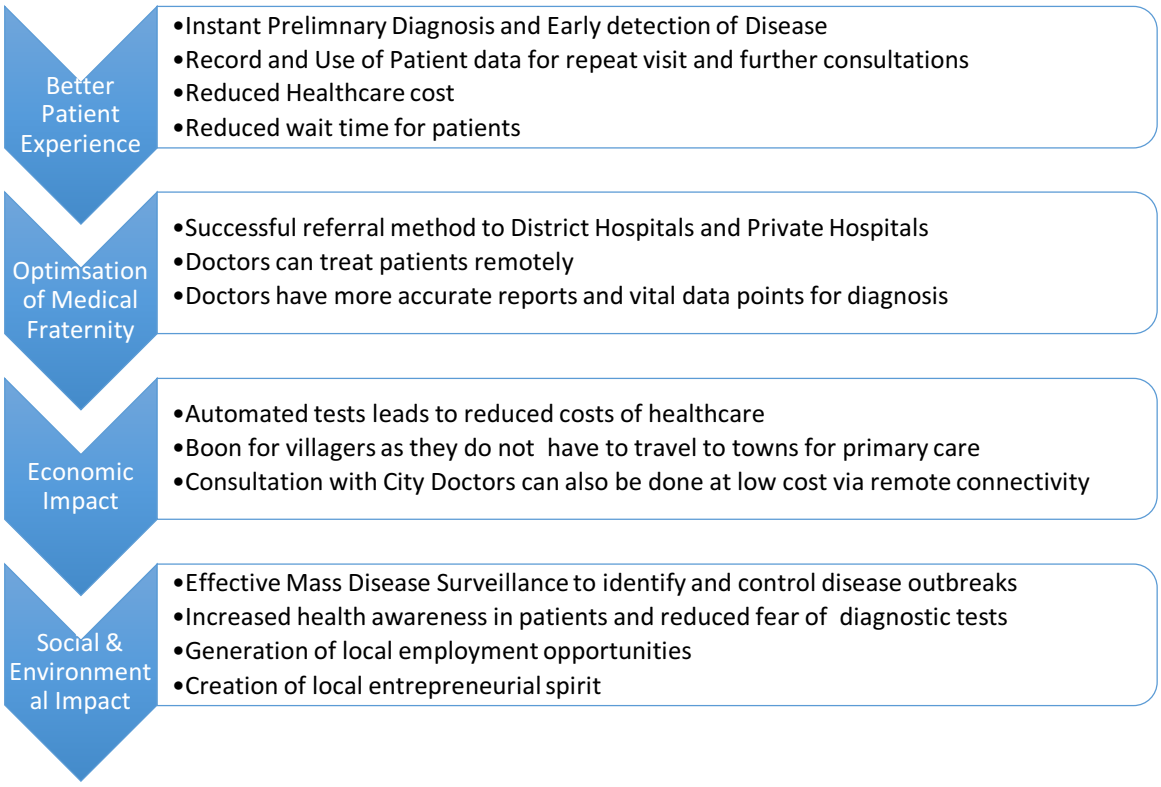
5.3 IMPACT OF THE KSHEMA INITIATIVE

In the initial phase, KEONICS and KTwo had deployed 110 telemedicine kiosks at PHCs belonging to 22 Districts and DHs with connectivity between PHCs, DHs and State Command Center.

By 2014, 84 PHCs, 22 Sadar Hospitals, 2 Medical colleges and 1 IGIC were functional and they serviced around 57000+ patients out of which 27000+ were male patients and 30000+ were female patients. These patients availed a total of 40000+ varied test services. Around 34500 patients had their vitals checked while around 4200 patients had checked their blood glucose levels. More than 1350 patients availed the ECG facility while more than 500 patients checked their urine profile.

Today, a total of 215 locations are operational at different levels of efficiency, serving over 275,000 patients per month with a gender ratio of 45% male to 55% female. Apart from checkups relating to the five vital signs, the tests for Blood Sugar, BP, Pulse rate, 12 lead ECG, X- Ray digitization, ENT, Blood Smear for Malaria etc., were also provided and conducted at affordable prices, far below those at normal hospitals and diagnostic centres, and were accessible to villagers easily.

HOLISTIC IMPACT OF INITIATIVE



The overall impact of this initiative can be evaluated based on the increase in extent of usage by the rural population over the given time period. The access to affordable healthcare products and services to the low-income groups dominating the rural regions of the state has increased the quality of health across different regions within the state with improved health conditions amongst women in particular. The indirect effect as intended from this service is to improve the overall development of the society i.e., HDI (Human Development Index). Given the improvements in access to healthcare services to those in need, we can say that the initiative has had a positive impact on the standards of living across various rural regions within the state. The introduction of these telemedicine kiosks has provided access to healthcare services to individuals suffering from treatable medical conditions and curable diseases.

RELATIVE HUMAN DEVELOPMENT RANKING OF 17 MAJOR INDIAN STATES			
STATE	HDI RANK IN 2007-2008	HDI RANK IN 2014	CHANGE
Kerela	1	1	No Change
Himachal Pradesh	2	2	No Change
Tamil Nadu	5	3	Increase
Maharashtra	4	4	No Change
Punjab	3	5	Decrease
Haryana	6	6	No Change
Jammu and Kashmir	7	7	No Change
Karnataka	9	8	Decrease
Andhra Pradesh	11	9	Increase
Gujurat	8	10	Decrease
West Bengal	10	11	Decrease
Rajasthan	13	12	Increase
Odisha	17	13	Increase
Madhya Pradesh	15	14	Increase
Assam	12	15	Decrease
Uttar Pradesh	14	16	Decrease
Bihar	16	17	Decrease

Figure 5: HDI of major states in India. Source: Live Mint

The long-term objective behind this affordable healthcare scheme is to improve the overall quality of health condition across various socio-economic groups living across the rural regions of the state. Such improvements in health status would lead to better quality of life

and an improved standard of living. An increase in labor output would lead to better production and increase in consumption. Given that women form a significant part of the farming and small scale industry labor force, an improvement in their health and well-being would add to better performance and development of overall local economy.

A secondary impact of the initiative includes training and recruitment of local people for the facility operations adding towards local skill development and employment. As the KEONICS vendor operate on a revenue sharing with the local centre in charge, it has led to development of local entrepreneurship.

6.0 WHY DID THIS INITIATIVE NOT SUCCEED TO ITS DESIRED LEVEL AND STALL MID-WAY

The reasons leading to the lesser than expected success and stalling of this initiative can be rooted to several issues. Starting with the number of units that have been setup. Only 215 units have been setup excluding the central command unit, which is completely functional. Some of the main reasons for the initiative not succeeding are as follows:

1. Leakage in Local level Operations

Given the remote nature of the operational units (PHC's), there were several leakages in revenue due to weak operational management. These leakages were in the form of staff overcharging patients, poor maintenance of patient records, misreporting of information including daily patient inflow and revenue collections, etc.

2. Business Cash Flow Synchronization with Government Revenue Due

The accounts of the kiosk units and SHSB were not synchronized, with several instances where in payments were delayed by months between the government and the kiosks due to operational issues like delay in clearance of bills, submissions and clarifications. As a result, the kiosk units had less money to work for day-to-day working expenses.

The vendor who was sub-contracted did not have the financial backing to support the operations of the project and could not withstand month long delays. Having limited financial capacity to manage the working capital requirements, the units couldn't expand the operations beyond a certain point. In some locations where they operational revenue didn't allow them to breakeven they shut down the units due to insufficient cash flow to manage work capital requirement.

3. Inadequate Capital Expenditure Planning

While over 80% of the capex for delivering the multi-diagnostic kiosk unit was provided, the pace of scale up was slow and the vendor had not properly accounted for the costing of the same leading to a mismatch in overall cost of the project. The inefficiency in capital expenditure management led to high cost per unit. A lower cost alternative, which met all the

functional requirements for the testing of patients, EMR and remote connectivity would have ensured project viability for the KEONICS vendor.

4. **Lack of awareness amongst local population**

The underlying assumption of this initiative was a steady increase in patient inflow to avail several tests and medical services on a regular basis. To attain the same, the Government has been involved in several awareness activities broadcasting the details on radio and television emissions. However, there is still a lack of awareness and hence a lack of adequate patient traffic at several Kiosks. This has affected the overall sales revenue, leading to a decline in profitability and in some cases operational viability (break-even).

7.0 RECOMMENDATIONS

1. **Better publicity and tie-ups with Hospitals and Doctors**

Given that the major causes of the under-achievement of the project was a lack of awareness amongst the population to utilize the KSHEMA Kiosks. A sustained program for improving awareness would be one of the best ways to improve patient traffic. With regular and periodic local media announcements, and creating awareness using local influence groups like Village Pradhan / Sarpanch (Chief) tie-ups, district level tie-ups for disseminating information on the benefits of these telemedicine kiosks, a steady growth in Kiosk utilization can be achieved. Moreover, tie-ups with recognized private hospitals would also improve brand image and gain better publicity especially for advanced consultations and second opinions for the patients.

2. **Payment as per a pre-approved grid on automatic basis with monthly sample audit**

One of the key problems faced by the Kiosk operator were irregular and delayed payments. Hence, ensuring that payments are made on the basis of an agreed upon grid of parameters would reduce the impact of this problem. Using Aadhar Card (Nationwide Bio-Metric Database of Citizens) data of patients and using the EMR and data capture system to automatic generate system reports would enable such a system. It is recommended that these payments be automated in order to reduce human error. A random sample data audit would avoid any misreporting by the vendor.

3. **Diversification of project risk between different vendors and by size of the vendor with prior experience in similar projects**

It is probable that the project was awarded to a vendor that had no experience in handling a project of this size or does not have the requisite working capital for this mammoth initiative. While KEONICS is a government body, the vendors of KEONICS carry out the implementation of the project. Hence, it may have been more prudent to diversify risks by splitting this project up district-wise and awarding each district or clusters of districts to a particular vendor.

This is a model which has been very successfully rolled out during the AADHAR campaign to map all citizens of India on a bio-metric basis on a national database. This has also been

successfully used by the Passport department who have outsourced this to Tata Consultancy Services (TCS) and by the Income Tax department for issuance of PAN Cards.

This reduces the risk of failure faced by the government as one vendor's failure to implement or continue does not impact other vendors, i.e. one region will not impact another. It also reduces risk by focusing the efforts of a vendor in one region.

The SHSB could also give the tender to a vendor company that has experience in projects of a similar size, i.e., one that has done projects of at least 75% of this size. Companies of this size will have the financial capabilities and competencies to handle project snags such as delayed payments. They will also have the expertise to carry out such projects efficiently.

4. Incorporating lessons from successful models in India and Globally to improve KSHEMA operations

To better understand the nature of managing an initiative on this scale, it is important to understand the dynamics of managing the operations of one such telemedicine units that would deliver the kind of services across a vast geography and the economics of running the entire operation sustainably.

Some of the successful cases including those implemented in Bangalore, where 18 kiosks centres have been setup across southern parts to provide affordable medical check-up and test. In Tamil Nadu, Aravind Eye Care manages and operates 39 vision centres. There are also the telemedicine projects run by the Madras Diabetes Research Foundation and JIPMER. Apollo Hospitals manage over 200 telemedicine units across several rural geographies.

However, the biggest player in the World is Narayana Hrudayalaya. The Company manages 900 telemedicine centres in 60 countries—800 are in India while 50 are in Africa, West Asia, Asia and the Far East— and offers 3.5 lakh tele-consultations annually. The reason for their impressive reach is their collaboration with Indian Space Research Organization (ISRO), which provided a dedicated spectrum from their satellite to Hrudayalaya to conduct activities across their centres. Of these, 340 centres were set up by ISRO while the rest are private and state government units in North East, Orissa, Andhra Pradesh, Bengal and Tamil Nadu.

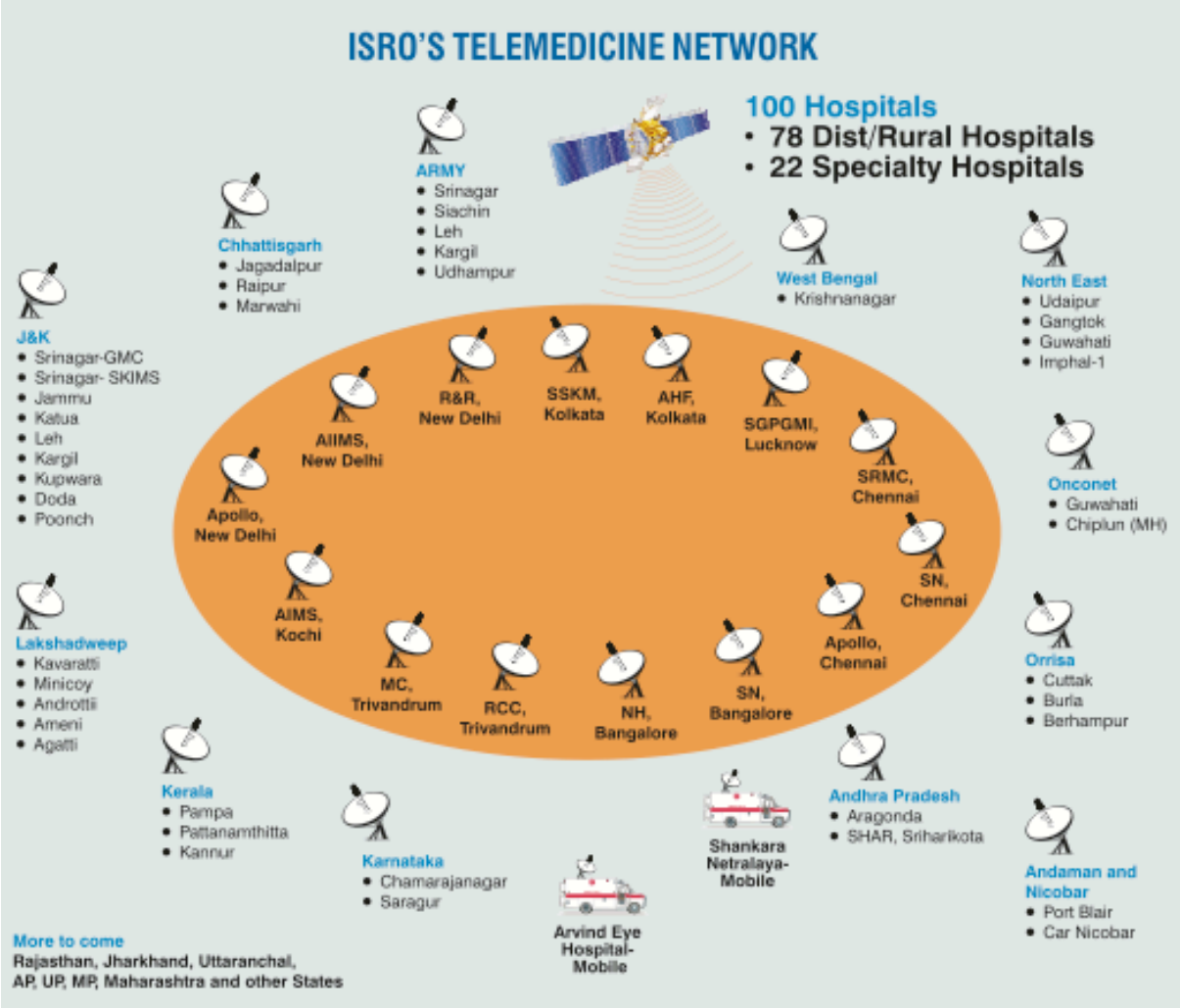


Figure 6: ISRO's Telemedicine Network - All India

Internationally, one of the biggest organizations is the American Telemedicine Organization, which was established in 1993. They estimate a total of 3000 remote sites offering various telemedicine services within the United States of America. These sites are managed and operated by over 200 different companies offering state of the healthcare services.

Amongst the developed nations we have cases in the UK, where you have companies like Telemedicine Clinic, which has been providing remote radiology reporting services to 90 NHS Trusts with over 250,000 MRI scans in the past decade. In German, they have German Society of Telemedicine (DGTelemed) a national association, which promotes modern innovative developments, solutions and products in telemedicine. One of Germany's largest telemedicine (CCS Telehealth Ostsachsen) undertakings went online in Dresden in 2015.

Japan, which has one of the best healthcare systems in the world, has a robust means of delivering effective telemedicine and telecare services (Japan Telemedicine and Telecare Association). The health ministry has introduced dedicated policies to ensure effective delivery of healthcare service covering all kinds of treatments, especially for the aging population.

The above-mentioned case studies and examples can be used to better evaluate, understand, and improve the functionality and performance of the KSHEMA Kiosks initiative. End of the day, it is the quality of execution along with the appropriate technology which will enable the most effective outreach to the rural population of Bihar to primary healthcare.

8 Bibliography and Media Reports and Images

1. State Government of Bihar Tender for NARTAN Kshema Telemedecine Kiosk - 164.100.130.11:8091/shs/tenders/2012/NartanTender.pdf
2. Press Releases pertaining to Telemedicine Kiosks in Bihar and Karnataka - http://www.slideshare.net/Sagar30/press-release-articles-brochures-bbmp-nartan-final-02
3. Ministry of Ayush - http://ayush.gov.in/
4. Government of Bihar - http://gov.bih.nic.in/
5. Rural Healthcare Survey, India: https://nrhm-mis.nic.in/RURAL%20HEALTH%20STATISTICS/(A)RHS%20-%202015/Rural%20Health%20Care%20System%20in%20India.pdf
6. Kshema Unified Health Care System - http://www.slideshare.net/Sagar30/kshema-unified-healthcaresystesm10-23931051
7. State Health Society, Bihar - Healthcare Infrastructure - http://164.100.130.11:8091/healthinfra.html
8. KSHEMA Unified Healthcare System Newsletter - http://origiin.com/origiin-newsletter/?p=200
9. News article 1: http://www.business-standard.com/article/companies/keonics-ktwo-expands-rural-telemedicine-project-in-bihar-113112700945_1.html
10. News article 2: http://www.business-standard.com/article/companies/the-promise-of-telemedicine-112031400058_1.html
11. News article 3: http://www.deccanherald.com/content/269441/F#
12. News article 4: http://www.livemint.com/Industry/32aK5ZPBPZ8voX4R4z5wpO/Checkups-to-cost-Rs20-in-rural-TN.html
13. News article 5: http://www.thehindu.com/todays-paper/tp-national/tp-tamilnadu/jipmer-to-expand-telemedicine-network/article7898305.ece
14. News article 6: http://mdrf.in/telemedicine.html
15. News article 7: http://eindia.eletsonline.com/2013/Hyderabad/Health/nartan-kshema-telemdicine-network-in-bihar-state-state-health-society-bihar/
16. Apollo Telemedicine: http://www.apollotelehealth.com:9013/about.jsp
17. Narayana Telemedicine: http://www.narayanahealth.org/telemedicine
18. District Map of Bihar: http://www.thisismyindia.com/images/india-maps/bihar-map.jpg
19. Healthcare report: http://www.sankalpforum.com/wp-content/uploads/2013/05/healthcare-report-20120831-2.pdf

20. India Population Map: http://image.slidesharecdn.com/healthcaremarketoverviewindia-may2014-140508035251-phpapp01/95/healthcare-market-overview-india-may-2014-3-638.jpg?cb=1399947682
21. Telemedicine Concept diagram: https://srishtispacelab.wordpress.com/2013/11/25/week-2-exploration-of-telemedicine/
22. Image KSHEMA Kiosk Technology: http://image.slidesharecdn.com/kshema-unifiedhealthcaresystesm1-0-130705005018-phpapp01/95/kshema-unified-healthcaresystesm10-9-638.jpg?cb=1372985459
23. ISRO Network: http://shiksha.isro.gov.in/pdf/brochures/4.pdf
24. American Telemedicine Association: http://www.americantelemed.org/
25. UK Telemedicine Clinic: https://www.telemedicineclinic.com/about-tmc/
26. German Telemedicine Association: http://www.dgtelemed.de/
27. Japan Telemedicine and Telecare Association: http://jtta.umin.jp/eng/
28. Images of Telemedicine in Bihar

29. Media Coverage in Hindi in Dainik Jagran Newspaper

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ISO 9001 : 2008

3.5 An Article in one of the Bihar Daily called "DAINIK JAGRAN" dated 29th April 2013.

वर्ष 1 अंक 296
पृष्ठ 18
भागलपुर, सोमवार
29 अप्रैल 2013
नगर संस्करण
मूल्य ₹ 3.00

दैनिक जागरण

राज्य के 98 स्वास्थ्य केंद्रों में टेली मेडिसीन सेवा

स्वास्थ्य महाकुंभ के समापन समारोह में स्वास्थ्य मंत्री अश्विनी कुमार चौबे ने किया सेवा का शुभारंभ

स्वास्थ्य महाकुंभ के समापन पर लोगों को संबोधित करते अश्विनी चौबे। जागरण

- भागलपुर व नालंदा के सदर अस्पतालों में भी उपलब्ध होगी सुविधा
- डीपीएल पंजीयनों को निशुल्क मिलेगी सुविधा, अन्य के लिए तय किया जाएगा न्यूनतम शुल्क

जागरण संवाददाता, भागलपुर : राज्य के 29 प्राथमिक स्वास्थ्य केंद्र, 19 सदर अस्पताल सहित 98 टेली मेडिसीन सेवा से जुड़ गए। इनमें भागलपुर जिले के सदर अस्पताल, नवगछिया सदर अस्पताल, सुलतानगंज, पीरपैंती, कहलगांव और सबौर रेफरल अस्पताल और ग्रामीण स्वास्थ्य केंद्र शामिल हैं। स्वास्थ्य महाकुंभ के समापन मंच से स्वास्थ्य मंत्री अश्विनी कुमार चौबे ने इस सेवा का शुभारंभ किया।

चौबे ने कहा, गांव गांव के अंदर बसे ग्रामीण स्वास्थ्य केंद्र इस सेवा से जुड़ जाएंगे। इससे गांवों के किसान-मजदूरों को बेहतर चिकित्सा के लिए दूसरे राज्यों में नहीं जाना पड़ेगा। इन टेलिहेल्थ स्वास्थ्य केंद्रों में हो विशेषज्ञ चिकित्सकों के साथ टेली मेडिसीन सेवा के तहत संवेदी कराकर इलाज की व्यवस्था उपलब्ध कराई जाएगी। चौबे ने कहा, जन-जन को स्वस्थ बनाने के संकल्प के साथ स्वास्थ्य महाकुंभ का आयोजन किया गया था। 30 जून तक 152 और स्वास्थ्य केंद्रों में इलाज की ऐसी व्यवस्था कराई जाएगी। किन केंद्रों में टेली मेडिसीन सेवा शुरू होगी उनमें एक आयुष चिकित्सक, एक मेडिकल स्टॉफ तथा एक कम्प्यूटर ऑपरेटर होगा। मरीज के साथ काउंसिलिंग के बाद वहां ऐप निकलेगा। बीपीएल श्रेणी के लोगों को इस तरह की सुविधा निशुल्क मिलेगी। शेष लोगों के लिए न्यूनतम राशि का निर्धारण स्वास्थ्य समिति करेगी। मंचासीन समारोह को जिलाधिकारी प्रेम सिंह मीणा, आयुक्त विनोद आनंद, सांसद पुलुल कुमारी, विधायक नीरज चौधरी, गोपाल साहा, तापेश राय, कुलपति डी नैयालाल चौधरी आदि ने संबोधित किया। कार्यक्रम में विशिष्ट सप्ताह अभियान के तहत 10 महिलाओं के बीच आग के चूल्हे का वितरण किया गया।

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30. Newspaper coverage in Times of India, Patna Edition

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3.4 . A press clipping from the ***'Times of India'*** dated ***5th May 2013*** highlighting the Health Minister Shri. Ashwini Kumar Choubey take on the progress of Telemedicine implemented under ***'National Rural Telemedicine Network Project of AYUSH, NRHM', Bihar***.

SUNDAY TIMES OF INDIA, PATNA *
MAY 5, 2013

Telemed network at 57 PHCs

Banjot Kaur Bhatia | TNN

Patna: Health minister Ashwini Kumar Choubey said here on Saturday the much-awaited telemedicine network to connect primary health centres (PHCs) has been established in 57 PHCs. The 155 remaining PHCs will be brought under the network by June.

The 57 PHCs have the facility to conduct 11 types of tests. Their results will be electronically transferred to district hospitals. Through videoconferencing, the patients will be able to consult not only district hospital doctors but also that of PMCH and AIIMS Patna, among others, said Choubey. The Ayush department of Union health ministry has earmarked more than Rs 27 crore for it over three years.

Under an MoU inked between the State Health Society of Bihar and Keonics, a Karnataka government-owned enterprise, in December, the telemedicine project was due to start in February.

The minister also said all steps have been taken to prevent deaths due to Japanese Encephalitis (JE). "Much against general perception of many children dying due to it, only one child has died of JE in Muzaffarpur. A compensation of Rs 50,000 has been paid in that case. I will seek an increase in compensation by the state cabinet," said Choubey.

He also said the department has mooted the idea of establishing community health centres, which will have specialized wards and residences for doctors on the campus.

Meanwhile, National Institute of Virology will open its centre in Patna shortly according to a communication received from Union health minister Ghulam Nabi Azad. He told Choubey that the Centre had agreed to set up three laboratories of NIV at Patna, Gaya and Muzaffarpur. These laboratories will test tissues for encephalitis.

Presssure politics won't work: Min

Amid the political heat within the NDA over prime ministerial candidate, Choubey said whosoever became the next prime minister, he would have to protect the interest of "Sant samaj" and be the flag-bearer of Hindu nationalism.

He said the BJP would like to go into the Lok Sabha election with its partner, JD-U but pressure politics won't work. "It is our sole prerogative to project any name. A suitable name will be projected at an appropriate time. Nobody can dictate terms on us." The BJP leader said NDA would improve upon its present tally in Lok Sabha if it fights (2014 poll) together. "However, the BJP is fully prepared to contest all 40 Lok Sabha constituencies alone," he said. TNN

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31. Business Standard Article on Keonics and Bihar Project

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KEONICS ISO 9001 : 2008

3.2 A clipping from '***Business Standard***' dated ***28th November 2012*** showcases that KEONICS and KTwo would work as Consortium to execute Telemedicine Solutions at Bihar, Patna

KTwo, Keonics consortium to partner Bihar for rural healthcare

BS REPORTER
Bangalore, 28 November

KTwo Technologies, a Bangalore-based company which is into healthcare solutions, is partnering with Karnataka-government owned Keonics to provide primary health care services in Bihar. The consortium has won the National Rural Tele Medicine Ayush Network (Nartan) and will set up a telemedicine delivery system across 212 primary health centres, 38 district hospitals and a central unit at Patna. The consortium has won this project on a Build Own Operate and Transfer (BOOT) model for 3 years.

KTwo, with its flagship product Kshema — Unified Healthcare System, would set up the primary and district health centres with a command and control centre in Patna to over steer the complete operation with video conferencing facilities. KTwo Technology Solutions founded by Anant R Koppar who completed his Doctoral research in "affordable and accessible healthcare system for rural India" had conceived the technology way back in 2007 and set up such Kshema kiosk in Karnataka, Maharashtra and other states in India.

Kshema Unified Healthcare System provides medical diagnostic facilities such as blood pressure, body temperature, ECG, urine analysis, blood sugar, SPO2, audio video consultation at point-of-care and establishes video conferencing facility with a distantly-located doctor in an urban or semi-urban centre for tele-consultation. Kshema captures electronic medical record of each patient and transmits clinical information over a network to offer tele-consultation by a doctor.

The software has the ability to automatically identify the vital parameters and transmit the parameters to the remote doctor through broadband or wireless connectivity.

"Kshema (which means well-being in Sanskrit) offers medical diagnosis, ongoing patient care and has an ability to monitor patients remotely by using applications with the underlying technologies," said Anant R Koppar.

Kshema, with its patent-pending software algorithms detects communicable diseases such as tuberculosis, malaria using its image processing techniques in less than 30 minutes at point-of-care across 250 locations in Bihar. Kshema's differential diagnostics software can detect ailments with symptoms captured at the kiosk by a paramedical staff without the help of a doctor.

'Kshema' unifies diagnostic hardware like microscope and vital signs monitor with the diagnostic software. The software consists of modules for electronic health records, pathology, radiology and vital signs monitor. The software has the ability to automatically identify the vital parameters and transmit the parameters to the remote doctor through broadband or wireless connectivity.

"Kshema provides a solution through which a paramedic can record the patient problems/sufferings/vital parameters which are then transferred to a remote districtity health centre with a doctor. The doctor can prescribe medication to the patient remotely. This is a product that can address the healthcare requirements," Koppar added.

With the healthcare delivery systems being overloaded in the developing and densely populated countries like India and China, it is imperative to have efficient and cost-effective systems and processes. "Building fresh leadership acumen in a complex and changing environment, establishing organisational excellence and designing new service delivery models will help us face the challenges. Kshema is the first step in this direction. Building better forward and backward linkages through a superior referral system would cause the secondary and tertiary care facilities to become more manageable, preventing them from being over burdened," Koppar pointed out.

Raviprakash, COO of KTwo Technology Solutions added, "The pressing need is to make quality healthcare accessible to the urban poor and rural masses and decrease patient clogging at city level hospitals. The non-availability of doctors at the rural healthcare centres and poor infrastructure are the present problems that make it difficult to satisfy this need. Hence there is a need for a system which can address the issues of non-availability of doctors and provide healthcare to the patient through the implementation of technology."

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