2.23 KIDROP: Preventing vision loss in premature infants of underserved areas in Karnataka

The Karnataka Internet Assisted Diagnosis of Retinopathy of Prematurity (KIDROP) project was initiated in 2008 by the Narayana Nethralaya Postgraduate Institute of Ophthalmology, Bengaluru and was integrated with the National Rural Health Mission (NRHM) in the Karnataka in 2009. It is India’s first and largest rural tele-medicine programme using tele-ophthalmology to tackle infant blindness, caused by Retinopathy of Prematurity (ROP). The KIDROP project uses trained technicians and digital equipment to provide diagnosis and treatment to premature infants in the under-served areas of rural Karnataka. As of 2014, KIDROP has screened over 17,800 infants in over 85 neonatal care centres across 19 districts of Karnataka since its launch.

Rationale

Retinopathy of Prematurity (ROP) is the leading cause of infant blindness in India. Approximately 7-15% of the babies who develop ROP need screening and treatment for the disease. However, there is an acute shortage of ophthalmologic resources in the country, and less than 20 centres in India undertake ROP management. Inadequate resources and lack of proper treatment and screening leave a majority of ROP-affected babies vulnerable to permanent and irreversible blindness.

In 2008, Narayana Nethralaya Postgraduate Institute of Ophthalmology, Bengaluru, initiated KIDROP to provide accurate diagnosis and suggestions for treatment to premature infants in under-served areas of rural Karnataka. The project uses RetCam Shuttle, which is a portable wide-field digital imaging device, to screen premature infants for ROP. The RetCam is capable of imaging 130 degrees of the retina of neonates, and is used to perform on-site examinations by trained technicians who are capable of triaging these images. The device can be used in both hospitals and rural centres. Narayana Nethralaya’s KIDROP team stores, reads, analyses and uploads these images from the rural centres in which they operate. After successful implementation of the programme by Narayana Nethralaya Postgraduate Institute of Ophthalmology in six districts for over 18 months, the KIDROP project collaborated with the NRHM, Ministry of Health and Family Welfare, Government of Karnataka, in 2009 and became India’s first public-private partnership (PPP) initiative in the field of infant blindness.

Objectives

The KIDROP initiative aims to provide primary and preventive eye care services to the rural infants who develop ROP. It tackles a major cause of blindness by improving access to advanced paediatric retinal care. The KIDROP model is focussed on establishing a telemedicine network for screening infant blindness and expanding the initiative across the country.

Key Stakeholders

Narayana Nethralaya Postgraduate Institute of Ophthalmology, Bengaluru, conceived this tele-ophthalmology project. The team comprises doctors, ROP experts, ophthalmologists and other specialists. Since 2009, the National Rural Health Mission, Ministry of Health and Family Welfare, Government of Karnataka, has been collaborating on KIDROP, and provides the financial support the project. i2iTeleSolutions is the technology partner for the project.

Figure 1: Key stakeholders
Implementation Strategy

KIDROP is based on the ‘triple T’ philosophy – telemedicine; training of peripheral ophthalmologists; and talking to neonatologists, paediatricians and gynaecologists. The project began with five centres in 2008, and expanded to provide its services in 25 centres across the southern districts of Karnataka. Most of the centres were located in rural areas, where, prior to KIDROP, there was no provision to screen for ROP.

The tele-ROP project started its work by visiting Neonatal Intensive Care Units (NICUs) in different areas. It used Information, Education and Communication (IEC) to create awareness about ROP among neonatologists and paediatricians. Spreading awareness about ROP is important, as it is the responsibility of neonatologists and paediatricians to refer all babies to the NICU for screening by the team on a prescribed day.

The process of screening starts with the digital imaging of infants’ retinas using the RetCam Shuttle. The specialised KIDROP team carries this camera to all the centres where screening is required. The technicians trained by the team are enrolled to conduct imaging of these infants, who are at the risk of developing ROP. The technicians are required to process, store, analyse and report the cases of ROP using a triage-based algorithm, based on the principle of ‘pattern recognition’ referred to by Dr. Anand Vinekar, Head of Department of Paediatric Retina and Paediatric Visual Rehabilitation at Narayana Nethralaya Postgraduate Institute of Ophthalmology.

The technicians classify the cases into three categories: 1) if a case requires urgent attention, it is referred to an ophthalmologist; 2) if ROP exists but is not serious and does not require treatment, the infant is categorised as requiring follow-up; and 3) if the retinal vessels have completed maturation, the infant can be discharged.

In the next stage, the technicians upload the images taken with the RetCam Shuttle on a server using a customised software. The ROP experts view the images on a computer or Apple iPhone, facilitated by a technology developed by i2i TeleSolutions in 2009. The technology enables access to real-time images and has been considered one of the top ten innovations in the medical domain. The reports generated by the doctors are then transferred to the technicians through cell phones or over the internet.

Image 1: A premature infant in neo-natal intensive care unit

Image 2: KIDROP staff screening infants
into a secure database server, with the signature of the doctor. In this way, a record of each patient is created for future use.

If an infant is diagnosed with ROP, the treatment is provided at the rural centre itself by the specialised KIDROP team and experts, including the locally trained ophthalmologists. The services are provided free of cost or are heavily subsidised. Only those who can afford to pay are charged.

The KIDROP team has imparted training to ophthalmologists, ophthalmic technicians and other non-technicians to become ROP experts. Approximately 14 teams have been trained to undertake screening and have been placed in remote areas of Karnataka. The team at KIDROP also encourages other states to send their doctors and staff for ROP training. It has expanded its training beyond Karnataka to states such as Rajasthan, Tamil Nadu, Odisha and Uttar Pradesh, as well as countries such as South Africa and the UAE.

**Technological innovation**

KIDROP uses an innovative solution that allows doctors to easily view images on an iPhone using wireless data connectivity, without the need for a personal computer or the internet. KIDROP has trained technicians to screen infants in the peripheral centres using the RetCam Shuttle (Clarity MSI, USA) and store, read, analyse, grade and upload these images from the rural centre itself using an indigenously developed internet-based PACS system which also delivers these images to the remote expert on his or her iPhone or PC or iPad in real time. The KIDROP technicians receive live reports delivered through the internet-based server. The technology helps manage project data and records. It allows doctors to view retinal images even from remote locations and revisit a patient’s history whenever the need arises. Another advantage of using an iPhone is the better and clearer view of graphic images and the provision for enlarging images to focus on a particular area.

**Impact**

**Successful use of technological innovation to cure blindness at an early age:** The KIDROP programme is an innovative attempt to provide screening and treatment of ROP and cure infant blindness using innovative technology to deliver services even to the remote areas of Karnataka.
Wide coverage using technology: Using India’s first portable RetCam Shuttle, as of 2014 KIDROP services reach over 85 neonatal care centres across 19 districts – Davanagere, Haveir, Gadag, Bellary, Chitradurga, twin cities of Dharwad and Hubli in Central Karnataka; and the districts of Raichur, Bidar, Gulgarga, Bijapur, Bagalkot, Yadgir and Koppal in Northern Karnataka in a partnership with NRHM; and the districts of Mysore, Mandya, Kolar, Tumkur and Bengaluru Urban and Bengaluru Rural of Karnataka, and the initiative has managed to screen over 17,800 infants, provided laser treatment to over 1,161 infants, and conducted 53,282 imaging sessions.

Key Challenges

The KIDROP project has faced a variety of challenges, including low awareness, technological problems, organisational hurdles, financial sustainability issues, and problems related to collaboration with other programmes of the government and the PPP framework with the Government of Karnataka. However, efficient management and continuous dialogue between different stakeholders have helped overcome the challenges to a certain extent.

Lack of awareness in the community about the problem of infant blindness and its treatment posed a major challenge. To overcome this challenge and spread awareness about ROP and its treatment, many focus group meetings were organised for mothers, doctors, paramedics and neonatologists. The KIDROP team also started a Facebook page and used social media as a platform to increase awareness among all citizens.

The project also faced resistance to adoption of new technology, especially from stakeholders at the grassroots level. To make them comfortable with technology, efforts were made to conduct live video consultations, integrate work lists into MIS and send SMS reminders to patients’ caregivers for follow-up. Another technological challenge was the non-availability of 3G and wireless broadband services, which affected the delivery of services.

At times, delays in government funding acted as an impediment, as it held-up the purchase of equipment required for screening and treatment. The demand for improvement in RetCam at a lower cost was another issue faced by doctors. Better understanding and ownership among government staff would help in timely release of funds and prevent any disruption in the functioning of the project. Effective planning and better coordination between the public and private partners is important for the sustainability of any project of this nature.

One of the most serious problems for KIDROP has been the lack of experts. Statistics show that there are less than 20 ROP experts in India. The shortage of trained technicians and doctors affected proper coverage of all the centres even when there was an urgent need for screening of infants.

To avoid this scenario, KIDROP developed a specialised system that allowed screening of all the patients who are in urgent requirement of screening through provision of a red card, known as REDROP. The card is given to mothers whose babies weigh less than 2kg. It contains information on the risk of developing ROP and states the urgent need for screening at a hospital. Further follow-up with the mother is undertaken based on the condition of the infant.

Replicability and Sustainability

An innovative project, KIDROP has the potential to be easily replicated across other states and countries. It is a cost-effective and innovative model and the technology used in KIDROP can be easily replicated in other states; especially in remote areas where people lack access to services and cannot bear the cost of taking their babies to private urban hospitals.

The project has expanded over the years. Beginning with five centres in 2008, it now covers 85 centres across 19 districts of Karnataka that are covered by Narayana Nethralaya. It conducts screening at 81 hospitals spread across different geographical areas of the state. The team plans to expand the programme to the entire state.

The model has also been replicated in parts of Maharashtra and Gujarat with the assistance of the KIDROP team. In March 2013 a team from Rajasthan has initiated training in Bengaluru.

Awards and Recognition

KIDROP was awarded the prestigious “Innovation in Health Care through PPP” Popular Choice Award on November 15, 2012, at the e-India awards.

The technology used in the KIDROP model was selected in the category of “Top Ten Medical Innovations of 2009” by the India Today magazine.

Harvard Business Review has also mentioned KIDROP as a model of ‘reverse innovation’ for other countries to replicate.
KIDROP is partnering with other states in India and has requested the Government of India to expand this model of preventing infant blindness all over the country. Many states, such as Maharashtra and Gujarat, have replicated the model in some parts with the help of the KIDROP team. In view of the success of the KIDROP model, Rajasthan sent technicians for training in ROP screening to Bengaluru in 2013.

The sustainability aspect of this initiative has been immensely enhanced by the launch of Rogi Bal Swasthya Karyakram (RBSK) by the Government of India. This programme aims at detecting and averting disability in the age group of 0-5 years. KIDROP initiative is aiming at just one aspect of disability and can very well fit into the larger policy context provided by RBSK. The implementation of RBSK as a part of the NRHM makes it mandatory for all state governments to implement it. This amalgamation of KIDROP into the wider policy context through the RBSK and NRHM enhances the sustainability of the project.

Notes from the field: A visit to Mandya hospital and Sri Cheluvamba hospital for women, Mysore

Doctors and other specialists were seen counseling mothers who had come for their babies’ check-up and follow-up. The mothers were very satisfied and thankful to the KIDROP initiative and the team for providing eye care services free of cost. It was comforting for them to know that screening for ROP will protect their children from blindness.

Image 4: KIDROP screening centre
Source: KIDROP
The project has generated international interest as well, and many countries, including Thailand, Indonesia, Russia, Mexico, Dominican Republic, South Africa and Brazil, have shown interest in collaborating with the KIDROP team and adopting the model.

**Conclusion**

The KIDROP project has proven to be a financially viable ophthalmic care service provided across several districts in the state of Karnataka, especially in its remote underserved areas. Observing the success of this innovative ophthalmologic project in reaching out to the rural masses, many other states and countries have started collaborating with the KIDROP team to replicate the model and serve their citizens.

**FOREVER programme to screen babies’ eyes**

Under the existing initiative, Narayana Nethralaya has launched another comprehensive programme – FOREVER – to focus on ROP, eye care, vision and eye cancer, including rehabilitation. The programme provides universal screening to all babies for one year after birth through the government healthcare system. It is implemented in collaboration with the State government and complements the government-sponsored Rashtriya Bal Swasthya Karyakram (RBSK), a national programme for child welfare. Both the programmes will be expanded all over the country to reduce the incidence of infant blindness.

**Fact Sheet**

<table>
<thead>
<tr>
<th>Theme</th>
<th>Health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nodal Implementing Agency</td>
<td>Narayana Nethralaya, Bengaluru, in partnership with the Government of</td>
</tr>
<tr>
<td></td>
<td>Karnataka</td>
</tr>
<tr>
<td>Geographical Coverage</td>
<td>19 districts of Karnataka State</td>
</tr>
<tr>
<td>Target Groups</td>
<td>Infants and premature babies</td>
</tr>
<tr>
<td>Years of Implementation</td>
<td>2009 - Present (Initiated without government support in 2008)</td>
</tr>
</tbody>
</table>