Effective Strategies for Retinopathy of Prematurity Screening
in rural centers - *The KIDROP experience*

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Narayana Nethralaya Postgraduate Institute of Ophthalmology, Bangalore
No Financial Interest
A Leading Hospital in a Tier 2 Town

BW 1080 gm, POG 28 weeks

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sepsis</td>
<td>√</td>
</tr>
<tr>
<td>RDS</td>
<td>√</td>
</tr>
<tr>
<td>NEC</td>
<td>√</td>
</tr>
<tr>
<td>Poor Wt Gain</td>
<td>√</td>
</tr>
<tr>
<td>IVH</td>
<td>√</td>
</tr>
<tr>
<td>ROP</td>
<td>Screened at Day 70 of life</td>
</tr>
</tbody>
</table>
The Challenge
## Anatomical Site of blindness in children in 43 countries *

<table>
<thead>
<tr>
<th>Anatomical Site</th>
<th>EME</th>
<th>FSE</th>
<th>LAC</th>
<th>MEC</th>
<th>China</th>
<th>India</th>
<th>OAI</th>
<th>SSA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Globe</td>
<td>10</td>
<td>12</td>
<td>12</td>
<td>15</td>
<td>26</td>
<td>24</td>
<td>21</td>
<td>9</td>
</tr>
<tr>
<td>Cornea</td>
<td>1</td>
<td>2</td>
<td>8</td>
<td>8</td>
<td>4</td>
<td>28</td>
<td>21</td>
<td>31</td>
</tr>
<tr>
<td>Lens</td>
<td>8</td>
<td>11</td>
<td>7</td>
<td>20</td>
<td>19</td>
<td>11</td>
<td>19</td>
<td>9</td>
</tr>
<tr>
<td>Uvea</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td><strong>Retina</strong></td>
<td><strong>25</strong></td>
<td><strong>44</strong></td>
<td><strong>47</strong></td>
<td><strong>38</strong></td>
<td><strong>25</strong></td>
<td><strong>22</strong></td>
<td><strong>21</strong></td>
<td><strong>24</strong></td>
</tr>
<tr>
<td>Optic Nerve</td>
<td>25</td>
<td>15</td>
<td>12</td>
<td>7</td>
<td>14</td>
<td>6</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Glaucoma</td>
<td>1</td>
<td>3</td>
<td>8</td>
<td>5</td>
<td>9</td>
<td>3</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Others</td>
<td>28</td>
<td>8</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>6</td>
</tr>
</tbody>
</table>

* Clare Gilbert, LSHTM
Retinopathy of Prematurity – India’s ‘epidemic’ problem

ROP Epidemic: Leading cause of infant blindness

2 million at risk.

47% incidence, 10% blindness
Every two hours 3 infants reach threshold for treatment in India*

* Extrapolation based on GOI Data (2007) and PGI, Chandigarh, NICU Incidence
ROP screening is unfortunately **NOT** universal
Narayana Nethralaya Initiative

KIDROP’s Triple Strategy

- Tele-ROP
- Train peripheral ophthalmologists (ROP fellowship)
- Talking to and Training pediatricians & gynecologists
Myths & Barriers
Myth: ROP is not a rural disease

Retinopathy of Prematurity in a Rural Neonatal Intensive Care Unit in South India—A Prospective Study

Bhavana Hungi · Anand Vinekar · Narendra Datti · Pushpalatha Kariyappa · Sherine Braganza · Susheela Chinniah · Krishnamurthy Donthi · Bhujang Shetty

ROP group but was not statistically significant. Of the overall infants screened, 68 (57.6%) were heavier and older than the American screening cut-off. Of these, 36.8% had some stage ROP and 8% required treatment.

Conclusions: This is the first prospective ROP study from a district NICU in India and compares with previously published urban data. If Western-screening guidelines are used in the rural scenario, we risk a significant proportion of infants being missed who may require treatment.
APROP is an emerging as a rural problem in India.

Outcomes of a Protocol-Based Management for Zone 1
Retinopathy of Prematurity: The Indian Twin Cities ROP
Screening Program Report Number 2

Subhadra Jalali, Siddharth Kesarwani, and Anjili Hussain


APROP reported from 6 districts of Rural Karnataka
State in Southern India

The Strategies
Retinopathy of Prematurity

Summary of Recommendations

Retinopathy of prematurity (ROP) is emerging as one of the leading causes of preventable childhood blindness in India.

Screening for ROP should be performed in all preterm neonates who are born < 34 weeks gestation and/or < 1750 grams birth weight; as well as in babies 34-366/7 weeks gestation or 1750-2000 grams birth weight if they have risk factors for ROP.

The first retinal examination should be performed not later than 4 weeks of age or 30 days of life in infants born ≥ 28 weeks of gestational age. Infants born < 28 weeks or < 1200 grams birth weight should be screened early, by 2-3 weeks of age, to enable early identification of AP-ROP.


Pejawar R, Vinekar A, Bilagi A. for NNF writing committee on ROP
Low cost enrolment

REDROP

A Novel Low-Cost Strategy for Enrolling Infants into a ROP Screening Program

Vinekar A, Avadhani K et al
REDROP

Cost of enrollment per infant was < Rupees 5 (USD 10 cents)
Why they didn’t come....

<table>
<thead>
<tr>
<th>Reasons for NOT coming for screening</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobile number switched off / non-existent (could not remind)</td>
<td>63</td>
</tr>
<tr>
<td>Distance</td>
<td>8</td>
</tr>
<tr>
<td>No permission from male member</td>
<td>20</td>
</tr>
<tr>
<td>Health issues</td>
<td>6</td>
</tr>
<tr>
<td>No reason</td>
<td>3</td>
</tr>
</tbody>
</table>

Gender Bias??
82% of those who did not come were females.
72% of those who came were males
First PPP in Infant Blindness in India - ROP

2.3 Crores (2009-2012)

Innovative Initiative by Govt. of Karnataka

12 districts in Karnataka – North and Central zones
• Training; Ophthalmologists & OA
• “Reading Site”
• Treatment

• Funding for Camera & Laser
• Logistics: Support: Mobilization of the infants – screening and treatment
• Advocacy & Health
Narayana Nethralaya
KIDROP Trial
(Karnataka Internet Assisted Diagnosis of ROP)
2007 to date

Other States:
Maharashtra
Gujarat
Rajasthan
Karnataka coverage area

<table>
<thead>
<tr>
<th>Day</th>
<th>Zone 1</th>
<th>Zone 2 (NK)</th>
<th>Zone 3 (CK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mon</td>
<td>Mandya, Mysore, Chamrajnagar</td>
<td>Raichur</td>
<td>Davangere</td>
</tr>
<tr>
<td>Tue</td>
<td>Bangalore BBMP</td>
<td>Gulbarga</td>
<td>Chitradurga</td>
</tr>
<tr>
<td>Wed</td>
<td>Tumkur dist Hosur (TN)</td>
<td>Bidar</td>
<td>Bellary</td>
</tr>
<tr>
<td>Thu</td>
<td>Kolar</td>
<td>Bijapur</td>
<td>Haveri</td>
</tr>
<tr>
<td>Fri</td>
<td>Tumkur Pavagada</td>
<td>Bagalkot</td>
<td>Dharwad</td>
</tr>
<tr>
<td>Sat</td>
<td>Bangalore Urban</td>
<td>Koppal</td>
<td>Gadag</td>
</tr>
</tbody>
</table>

18 districts

74 hospitals

3 Independent teams
## Average speed of uploads

<table>
<thead>
<tr>
<th>Internet Speed</th>
<th>Time to Upload 1 patient’s images (14 images per infant)</th>
</tr>
</thead>
<tbody>
<tr>
<td>128 kbps</td>
<td>14 - 16 min</td>
</tr>
<tr>
<td>256 kbps</td>
<td>6 - 8 min</td>
</tr>
<tr>
<td>1 mbps</td>
<td>2 - 3 min</td>
</tr>
<tr>
<td>3.1 mbps</td>
<td>&lt; 2 min</td>
</tr>
<tr>
<td>3G (under test) on iPad</td>
<td>&lt; 1 min</td>
</tr>
</tbody>
</table>
• Studies captured by digital Fundus camera
• Uploader installed on Fundus camera workstation
• Uploader encrypts, compresses losslessly and transmits Studies to Server over LAN or WAN

• Stores Studies for download.
• Provides user services over the WEB such as:
  • Viewer download
  • Worklist creation
  • Workflow management.
  • Admin functions
  • User authentication

• Remote Ophthalmologist logs-in at the Server over WEB.
• Downloads viewer one time from server.
• Downloads worklist from server.
• Selects studies to download from the worklist.
• Downloads studies realtime and progressively views
• Uses Viewer tools to analyze images.

• Creates reports via WEB reporting feature or Word upload.
• Electronically signs and sends to Patient Site or forwards to consultant.
TRAINING @ KIDROP
Laser treatment & patient counseling in the Rural Outreach
KIDROP

- 2008: NN Initiative
- 2009 MOU with NRHM Karnataka
- 2010: Training
- 2011 (to date) Implementation
- Total: 23578 sessions
- 18 districts
- 614 laser procedures
<table>
<thead>
<tr>
<th>Strategy</th>
<th>Highest Burden</th>
<th>Coverage of susceptibles (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mothers coming to city with their infants</td>
<td>Patient</td>
<td>10-14%</td>
</tr>
<tr>
<td>ROP specialists screening in rural areas once a week</td>
<td>Individual Organization</td>
<td>34-58%</td>
</tr>
<tr>
<td>District Hospitals have one RETCAM each</td>
<td>Organization</td>
<td>88-95%</td>
</tr>
<tr>
<td>KIDROP</td>
<td>Balanced</td>
<td>&gt;90%</td>
</tr>
</tbody>
</table>

Study in association with IIM Bangalore Jan-Feb 2011
KIDROP - past achievements

“... a unique experiment in Tele-Ophthalmology provides hope to rural infants”

Harvard Business Review cites KIDROP as an example of ‘reverse innovation’
NRHM, Karnataka presents

Light of the Eyes...

a film on KIDROP

Karnataka Internet Assisted Diagnosis of Retinopathy of Prematurity
KARNATAKA INTERNET ASSISTED DIAGNOSIS FOR RETINOPATHY OF PREMATURITY

5 years
Preventing Infant Blindness
Using Technology & Passion
Sep 2007 - June 2012

2007 - 2012
Preventing Infant Blindness
Using Technology & Passion

2007 - 2012
Preventing Infant Blindness
Using Technology & Passion

2007 - 2012
Preventing Infant Blindness
Using Technology & Passion

2007 - 2012
Preventing Infant Blindness
Using Technology & Passion

The Journey Continues...

1. Journey Begins......
2. India's first Retcam Shuttle
3. 1st International invited talk on ROP
4. Award from Dalai Lama
5. Tele ROP platform established
6. World's 1st ROP App on an iPhone
7. India's 1st PPP in ROP (NRHM, Karnataka)
8. A Top 10 Medical Innovation
9. Thrombocytopenia: A new risk factor!
11. MEA calls KIDROP "Unique & Successful"
12. Positive Health Hero award
13. New technique of Infant OCT imaging
14. Govt. teams: training begins
15. Pune team trained
16. 10,000 babies crossed!
17. Bajaj Gandhi Award for Excellence
18. IIM Ahmedabad: KIDROP case study
19. A new OCT finding in ROP: IOVS
20. North Karnataka screening starts!
21. KIDROP Facebook page launched
22. Marquis Who's Who of the World
23. NRHM makes a movie on KIDROP
24. Gujarat team trained
25. Central Karnataka equipment installed
26. 600° laser performed!
THANK YOU

Working towards a world without ROP blindness*

* Video on YouTube

Follow the KIDROP Program on FACEBOOK

www.facebook.com/KIDROP