Innovative Screening Models and Their Impact on Global Eye Health

--- introduced by ---

Ian Wishart
The Fred Hollows Foundation
ABOUT US

WHO WE ARE
The Fred Hollows Foundation is an international development organisation focusing on blindness prevention and Indigenous Australian health. We are independent, not-for-profit, politically unaligned and secular.

OUR VISION
We see a world in which no person is needlessly blind and Indigenous Australians exercise their right to good health.

OUR INSPIRATION
We are inspired by the life and work of Professor Fred Hollows, an internationally acclaimed eye surgeon and an activist for social justice who championed the right of all people to high-quality and affordable eye care and good health.

OUR VALUES
Our values of integrity, empowerment, collaboration, and action underpin every aspect of our work both in Australia and around the globe.
Innovative Screening Models and Their Impact on Global Eye Health

Alan L. Robin, MD
Johns Hopkins University, University of Michigan, and Board of Aravind Eye Foundation
IS THERE A NEED FOR INNOVATIVE SCREENING?

1. How many of you are over 40?
   *And not had your eyes dilated in last two years?*

2. How many of you are over 60?
   *And not had a dilated exam in last year?*

3. How many of you are DIABETIC?
   *And not had a dilated exam in last year?*

4. How many of you have a family history of glaucoma?
   *And not had an eye exam in the last year?*

5. How many of you have *never* had a dilated examination of your eyes?
Treatable Causes of Global Moderate to Severe Visual Impairment/Blind: 2015

- Refractive Error 152.3 million
- Cataract 60 million
- Glaucoma 6.9 million
- Diabetic Retinopathy 2.6 million

ALL ARE UNNECESSARY
Blind: What Does It Really Mean?

VIDEO
The Costs Of Blindness
I see fine – *Crisis Driven*

- White hair and white eyes
- Multifactorial
  - Education
  - Gradual Processes
  - Access to care
- Who comes to screenings?
Why The Problem?

To paraphrase Steve Jobs:

• "People don’t know what they want [need] until you show it to them."


Getting What We Deserve

Health & Medical Care in AMERICA

Alfred Sommer, M.D., M.H.S.
So Just Educate & Scare
India:– Ideal For Disruption

“+” & ”-”

• Weak regulatory systems
  – Fail to enforce quality cost or quality
• Many receive inappropriate, unethical, or inadequate care
• Few with insurance
• Most self-employed
Aravind Eye Care System – Physical locations

Map showing locations in India with markers for different types of facilities like Tertiary Centres, Upcoming Hospitals, Vision Centre, Secondary and Surgery Centre, and Community and City Clinics.
In 1976

11 Beds

- **Tertiary Care Centers**: 1000 - 2000 patients
- **Secondary Care Centers**: 150 – 400 patients
- **Community Eye Clinics**: 100 - 150 patients
- **Primary Care Centers**: 20 - 25 patients

Specialty Care
Research Training
Tertiary Care Centers

- Cataract Services
- Specialty Diagnosis

- Comprehensive Eye Examination
- Minor procedures

A Day at Aravind

- 13,000 Patient Examinations
- 1,500 Surgeries
- 5 - 6 Outreach camps
- 300 transported to base for surgery
- Classes for 100 Residents & 300 techs & administrators
Aravind in 2016-17....

4.4 million Outpatient Examinations

463,125 Surgical, Laser & Intra-vitreal Inj. Procedures

600,000 Prescription Spectacles dispensed

50% for free / steeply subsidized
Built On
“Woman Power”
Previous Approach: Rural Eye Care

• Principles:
  – Reaching the unreached
  – Removing barriers
  – Community participation

• Impact:
  – Creating access
  – Growing the awareness

Screening Eye Camps
Present problems in Eye Care Services

Only 7% of people with eye problems in village accessed care from eye camps
VISION CENTERS:
Specific Objectives

- To cost effective provide primary eye care
- Permanent facilities with easy access.
- Create awareness about eye care in the community and influence health seeking behavior.
Aravind Vision Centers
Towards Universal Eye Care
**Contribution of 61 vision Centres to service Delivery in a year (2016-17)**

<table>
<thead>
<tr>
<th>Description</th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Number of Vision Centres</td>
<td>61</td>
<td>Population 4.0 million</td>
</tr>
<tr>
<td>Patients Reached (Outpatients - New)</td>
<td>299,975</td>
<td>7.5% of the population</td>
</tr>
<tr>
<td>Total outpatient visits</td>
<td>524,269</td>
<td></td>
</tr>
<tr>
<td>Cataract surgery done</td>
<td>16,341 (64% acceptance)</td>
<td>CSR: 3,600</td>
</tr>
<tr>
<td>Spectacles delivered</td>
<td>66,557 (85% acceptance)</td>
<td>12% of the Total OP</td>
</tr>
<tr>
<td>Specialty referral to the base hospital</td>
<td>24,412 (68% acceptance)</td>
<td>8% of the New OP</td>
</tr>
<tr>
<td>Tele consultations per day</td>
<td>1,691 at Aravind</td>
<td>28 per VC</td>
</tr>
</tbody>
</table>
Specialty patients referred from vision centres and registered at base hospital (16 Madurai vision centres)

<table>
<thead>
<tr>
<th>Year</th>
<th>IOL</th>
<th>Cornea</th>
<th>Glaucoma</th>
<th>Retina</th>
<th>Orbit</th>
<th>Pediatric</th>
<th>Uvea</th>
<th>Total</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>1,389</td>
<td>987</td>
<td>364</td>
<td>556</td>
<td>292</td>
<td>532</td>
<td>170</td>
<td>4,290</td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>1,482</td>
<td>1,199</td>
<td>487</td>
<td>838</td>
<td>375</td>
<td>595</td>
<td>244</td>
<td>5,220</td>
<td>22%</td>
</tr>
<tr>
<td>2015</td>
<td>2,439</td>
<td>1,633</td>
<td>593</td>
<td>838</td>
<td>466</td>
<td>740</td>
<td>462</td>
<td>7,171</td>
<td>37%</td>
</tr>
<tr>
<td>2016</td>
<td>3,006</td>
<td>1,655</td>
<td>1,042</td>
<td>1,495</td>
<td>744</td>
<td>802</td>
<td>433</td>
<td>9,177</td>
<td>28%</td>
</tr>
</tbody>
</table>
## Economic Impact: for each patient

<table>
<thead>
<tr>
<th></th>
<th>No</th>
<th>Transport</th>
<th>Other Expenses</th>
<th>Lost Wages</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>To the Hospital</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient</td>
<td>1</td>
<td>25</td>
<td>50</td>
<td>100</td>
<td>175</td>
</tr>
<tr>
<td>Patient attendant</td>
<td>1</td>
<td>25</td>
<td>50</td>
<td>100</td>
<td>175</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>50</td>
<td>100</td>
<td>200</td>
<td>350</td>
</tr>
<tr>
<td><strong>To the Vision Centre</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient</td>
<td>1</td>
<td>10</td>
<td>20</td>
<td>50</td>
<td>80</td>
</tr>
<tr>
<td>Patient attendant</td>
<td>0.5</td>
<td>5</td>
<td>10</td>
<td>25</td>
<td>40</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>15</td>
<td>30</td>
<td>75</td>
<td>120</td>
</tr>
<tr>
<td><strong>Rupees Saved</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Rs. 230 (roughly Rs. 50 lakhs for the 25,000 patients)</td>
</tr>
</tbody>
</table>
Can’t solve them

FIRST THE SIMPLE ISSUES
2.5 Billion Need Glasses: But No Access
625 Million Can’t Learn/Work Due Lack of Glasses

Issues

• Awareness (asymptomatic)
• Financial (Exam/Spectacles)
• Conflicting Commitments (other more urgent issues)
ASPIRATIONS:

GOALS:

Increase the number of children screened from 500,000 to one Million a year by 2020.
Self Refraction: Smart Phone
• Marketing, education, and social involvement

• Resource allocation

• Uptake
The Problem

• Both *Glaucoma & Diabetes* are leading causes of blindness but both are commonly either not diagnosed or misdiagnosed.

• **Costs** of missed cases are high
Screening: A Passé Concept


James M. Tielsch,¹ Joanne Katz,¹ Kuldev Singh,² Harry A. Quigley,¹ John D. Gottsch,³ Jonathan Javitt,⁴ and Alfred Sommer¹,⁵
Tonometry: IOP > 21 mm Hg: 47% Sensitivity & 92% Specificity
Humphrey Perimeter
A Large Space Invaders Game

• Not easy to carry in your purse or backpack

  **Full Field 120:**

• Only 50% can complete in 7 min 16 seconds/eye

• However, a suggestion of the value of suprathreshold perimetry:

  In **St. Lucia** sensitivity **86%**, specificity **84%**

### Undetected Glaucoma

<table>
<thead>
<tr>
<th>Location</th>
<th>Undetected (%)</th>
<th>Prevalence Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barbados</td>
<td>51%</td>
<td>Chennai Glaucoma Study 98.5%</td>
</tr>
<tr>
<td>Melbourne</td>
<td>60%</td>
<td>Andhra Pradesh Study 92.6%</td>
</tr>
<tr>
<td>Rotterdam</td>
<td>53%</td>
<td>Aravind Comprehensive Eye Study 93.0%</td>
</tr>
<tr>
<td>Blue Mountains</td>
<td>51%</td>
<td></td>
</tr>
</tbody>
</table>
Glaucoma Identified in Community Eye Screening

<table>
<thead>
<tr>
<th>Unit of Aravind Eye Care</th>
<th>Patients Screened in Community Outreach</th>
<th>Persons diagnosed with any Glaucoma (Percent of total OP seen)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Madurai</td>
<td>104 231</td>
<td>1057 (1.01%)</td>
</tr>
<tr>
<td>Tirunelveli</td>
<td>49 977</td>
<td>627 (1.22%)</td>
</tr>
<tr>
<td>Coimbatore</td>
<td>76 680</td>
<td>242 (0.30%)</td>
</tr>
<tr>
<td>Pondicherry</td>
<td>63 820</td>
<td>347 (0.50%)</td>
</tr>
<tr>
<td>Total for AECS</td>
<td>294 708</td>
<td>2273 (0.7%)</td>
</tr>
</tbody>
</table>
Ideal Screening

- Screen For Those Who Will Go Blind or Disabled In A Few Years
- Highly Sensitive
- Portable
- Inexpensive
- Not limited to a single test
- Relatively quick and painless
Classification of common human diseases derived from shared genetic and environmental determinants.
Diabetes: An Enormous Global Problem

• By 2030: Will afflict > 439 Million Worldwide
  – Increase from 6.4% to 7.7% of population
    • 69% increase in developing countries
    • 20% increase in developed countries
• Task of detecting and evaluating retinopathy is enormous
Diabetes In Kids: Increasing!

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Incidence Trends of Type 1 and Type 2 Diabetes among Youths, 2002–2012

CONCLUSIONS
The incidences of both type 1 and type 2 diabetes among youths increased significantly in the 2002–2012 period, particularly among youths of minority racial and ethnic groups. (Funded by the National Institute of Diabetes and Digestive and Kidney Diseases and the Centers for Disease Control and Prevention.)
So What Are The Facts? How Do We Do?

High Prevalence of Retinopathy in Kids

Less Than ½ Get Screened

**Incidence and Risk Factors for Developing Diabetic Retinopathy among Youths with Type 1 or Type 2 Diabetes throughout the United States**

Sophia Y. Wang, MD,1 Chris A. Andrews, PhD,1,2 William H. Herman, MD, MPH,3,4,5 Thomas W. Gardner, MD, MS,6,7 Joshua D. Stein, MD, MS*1,2

**JAMA Ophthalmology | Original Investigation**

Ophthalmic Screening Patterns Among Youths With Diabetes Enrolled in a Large US Managed Care Network

Sophia Y. Wang, MD, Chris A. Andrews, PhD, Thomas W. Gardner, MD, MS; Michael Wood, MD; Kanakadurga Singer, MD, Joshua D. Stein, MD, MS

**CONCLUSIONS AND RELEVANCE** Despite possessing health insurance, many youths with diabetes are not receiving eye examinations by 6 years after initial diagnosis to monitor for DR. These data suggest that adherence to clinical practice guidelines is particularly challenging for racial minorities and youths from less affluent families.
#1 – Remote Locations
#2 – High Volume Cataract-Centric Eye Camps
Who Does Screening

• Trained Assistant
• No Need High Level Training – Just Directed Training.

(J Am Acad Dermatol 2012;66:687-8.)

Utilizing hairdressers for early detection of head and neck melanoma: An untapped resource

Neda Roosta, BA,a Michael K. Wong, MD, PhD,b and David T. Woodley, MD,a on behalf of the Norris Comprehensive Cancer Center Melanoma Working Group

Los Angeles, California
1st Vision: Pixelated ETDRS – On iPad
2\textsuperscript{nd}: The Camera
3rd: The Visual Field
All Digitally Transmitted
PI Mydriatic
\[\text{Gold Standard}\]
Validation: Universities Michigan, Johns Hopkins

Mydriatic

‘Gold Standard’

Non Mydriatic
Tester:
Naïve To Perimetry and Apple
Total points tested: 16
Points seen: 16 (100%)

You have done very well!
iPad Perimetry

Humphrey

iPad
Visual Fields

Easy Field – I pad

HFA

Validation: University of IOWA
The Future
AI: The Eye Is The Window to The Soul: Predict 5 year risk of MI or Stroke
Times Are Changing—Innovation Is Crucial—Think Outside the Box!