

# 24

## Chapter 24

# Screening and Treatment of Retinopathy of Prematurity: ROP Network Model

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### Rationale

Retinopathy of prematurity (ROP) is an important cause of preventable visual impairment or blindness in Thailand and many parts of the world<sup>1</sup>. Risk factors include pre-term birth, low birth weight and having oxygen therapy. The visual outcome of ROP depends on early detection and treatment. Late detection and/or delayed treatment can lead to a severe visual impairment or even blindness. The American Academy of Ophthalmology and The American Academy of Pediatrics require screening of ROP by an “expert ophthalmologist” who is experienced in the examination of preterm infants for ROP<sup>2</sup>. In Thailand, especially in the Northeast area, it is not possible to have enough “expert ophthalmologists” in all provincial hospitals. In reality, infants with risks of ROP are examined by general ophthalmologists at the local hospitals. This situation leads to 2 serious problems:

1. Unnecessary referral: Infants are referred while they can be just followed at the local hospitals. The referral process causes expense and may pose risks on infants who need ventilatory support.
2. Missed diagnosis: On the contrary, infants who need treatment and referral may be missed by the local ophthalmologists. This causes delayed treatment and visual impairment.

RetCam Shuttle® (Clarity Medical Systems, Inc., Pleasanton, CA) is a mobile fundus camera that is capable of imaging the infant’s retina and enable ophthalmologist to review the images for screening and diagnosis of ROP. With this camera, it is possible to take images of the infant’s retina by a trained technician at the local hospital and then send the images over the internet to an expert ophthalmologist far away for reviewing and making diagnosis. The four-hospitals of the 7<sup>th</sup> health service area, namely Khon Kaen, Roi Et, Kalasin and Maha Sarakham provincial hospitals, has initiated a “ROP network program” to utilize the aforementioned model. A “ROP Screening Telemedicine Software” was developed to use as a tool for ROP database and images repository. This program is supported by the Committee “Thai Maternal and Child Health Network Project under the Patronage of HRH Princess Srirasmi”.

After an infant's fundus has been taken by a trained technician at the local hospital, the images are sent to the server and simultaneously the server will send notification to an expert ophthalmologist who will retrieve the images using any of the following devices: a desktop computer, a tablet or a smart phone (both iOS and Android). The expert ophthalmologist who is in another place, can then review the images, make decision about diagnosis of ROP, and recommendation for referral. With this system, the number of unnecessary referral and traveling of the infants can be reduced.

### **Instrumentations (Hardware, Software)**

1. Photographer: ophthalmic technician, NICU nurse, or other well-trained personnel.
2. Fundus camera: RetCam Shuttle®.
3. ROP Screening Telemedicine Software: custom developed software.
4. Expert ophthalmologist (Image reader): pediatric ophthalmologist or retina specialist.
5. Data entry and image reading devices: computer, tablet or smart phone (both iOS and android).

### **Keys Success Factors**

1. Understanding and awareness of the problem by all involved personnel at all level by creating collaboration in a networking model.
2. Collaboration between ophthalmologists, pediatricians, ophthalmic nurses, NICU nurses, ophthalmic technicians and other relating personnel.
3. Full support by top executives of the organization.
4. Evaluation and problem solving regularly during the operation.

### **Results**

1. All preterm infants are screened (100%) at the appropriate time by acceptable standard of practice.
2. Only infants that need treatment are referred. The number of "unnecessary referral" is much reduced.
3. Initiation of "ROP Network Model" that involve collaboration of all involved departments especially ophthalmologists and pediatricians.
4. Initiation of networking and collaboration of ROP screening program among the 4 provinces in the northeast area, which can be used as a prototype for other parts of Thailand.
5. Establishment of "ROP database" and development of "ROP Telemedicine System" for the screening, diagnosis and treatment of ROP. This system is developed by Thai developers which has the benefit of full customization and reduced cost compared to purchasing commercially available systems.

## References

1. Gilbert C. Retinopathy of prematurity: a global perspective of the epidemics, population of babies at risk and implications for control. *Early Hum Dev.* 2008 Feb; 84(2): 77–82.
2. Fierson WM, American Academy of Pediatrics Section on Ophthalmology, American Academy of Ophthalmology, American Association for Pediatric Ophthalmology and Strabismus, American Association of Certified Orthoptists. Screening examination of premature infants for retinopathy of prematurity. *Pediatrics* 2013 Jan;131(1): 189–95.

