Telemedicine for Retinopathy of Prematurity

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• No financial disclosure
• a simple, valid, noninvasive, and inexpensive screening examination is necessary to identify infants who are at increased risk for developing ROP.

• reference standard for the screening and diagnosis of ROP is a live dilated examination by an ophthalmologist using binocular indirect ophthalmoscopy (BIO), often with scleral indentation
• limited number of ophthalmologists.
• significant workforce limitations, including concerns about medicolegal liability, low reimbursement.
• few trained ophthalmologists may be available and/or willing to perform ROP screening examinations
• significant variability between examiners diagnosing ROP using BIO
Current guidelines support the use of remote digital fundus imaging to identify individuals with referral-warranted ROP (RW-ROP), but recommend that at least one BIO examination is completed before initiation of treatment or termination of ROP monitoring, as current cameras do not allow for adequate view of the peripheral retina.
e-ROP study (evaluating acute phase ROP)

- 90% sensitivity, 87% specificity, 97.3% negative predictive value and 62.5% positive predictive value.
- There were 3 infants out of the 162 treated who did not have RW-ROP detected on the remote imaging preceding treatment.
- The i-ROP (imaging and informatics in retinopathy of prematurity) consortium also found that there was a slightly higher accuracy for diagnosis of zone III and stage 3 ROP on live examination than with imaging.
Stanford University Network for Diagnosis of Retinopathy of Prematurity (SUNDROP)

• Hybrid model

• 100% sensitivity, 100% negative predictive value, 99.8% specificity, 95.5% positive predictive value

ROP telemedicine

guideline for imagers

Imaging system

Guideline for reading centers

Automated image analysis
GUIDELINES FOR IMAGERS

• A team of at least two people is recommended for image acquisition
• Initial education of imagers in the e-ROP study consisted of general training on ROP, premature infants, and image acquisition including positioning infants and maintaining comfort
IMAGING SYSTEMS

• Retcam
• Visunex Panocam
• Phoenix ICON system
Live image with Binocular Indirect Ophthalmoscope

Views required to cover the equivalent area

Permanent documentation with BIO

Live image with RetCam

RetCam

Permanent digital documentation with RetCam
3Nethra Neo
• Nonphysician graders in the e-ROP study underwent a three phase process including training, precertification, and final certification.

• The Global Education Network-ROP group has created a tele-education program for ROP to further the education of physicians evaluating ROP images.
AUTOMATED IMAGE ANALYSIS

Deep learning developed to extract tortuosity and dilation features from arteries and veins.
COSTS OF REMOTE ROP SCREENING

• costs are decreasing with the release of new cameras, such as the Neo, and expansion to nontraditional cameras, such as the Pictor.

• if a specialist nurse were to travel among NICUs to capture and interpret images, this would be substantially less expensive.

References

- Telemedicine for Retinopathy of Prematurity Christopher J. Brady, MD, MHS,1 Samantha D’Amico, MS,2 and J. Peter Campbell, MD, MPH. TELEMEDICINE and e-HEALTH. VOL. 26 NO. 4 APRIL 2020.

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