APTOS 2018 SINGAPORE

THE 3RD ASIA-PACIFIC TELE-OPHTHALMOLOGY SOCIETY (APTOS) SYMPOSIUM

7 - 8 July, 2018

Academia (SGH Campus), Singapore

APTOS
ASIA-PACIFIC TELE-OPHTHALMOLOGY SOCIETY

Singapore National Eye Centre
SingHealth

SINGAPORE EYE RESEARCH INSTITUTE

SingHealth DukeNUS
ACADEMIC MEDICAL CENTRE

START STRONG STAY STRONG[1-5]

EYLEA®
(aflibercept solution for injection)

References: 1. Ikuno Y, Ohno-Matsui K, Wong TY, et al. Intravitreal aflibercept injection in patients with myopic choroidal neovascularization: the MYRROR Study. Ophthalmology. 2015;122(6):1220-1227. doi:10.1016/ j.ophtha.2015.01.025. **2.** Heier JS, Brown DM, Chong V, et al. Intravitreal aflibercept (VEGF Trap-Eye) in wet age-related macular degeneration. Ophthalmology. 2012;119(12):2537-2548. doi:10.1016/ j.ophtha.2012.09.006. **3.** Campochiaro PA, Clark WL, Boyer DS, et al. Intravitreal aflibercept for macular edema following branch retinal vein occlusion: the 24-week results of the VIBRANT study. Ophthalmology. 2015;122(3):538-544. doi:10.1016/j. ophtha.2014.08.031. **4.** Korobelnik J-F, Holz FG, Roider J, et al. Intravitreal aflibercept injection for macular edema resulting from central retinal vein occlusion: one-year results of the phase 3 GALILEO study. Ophthalmology. 2014;121:202-208. doi:10.1016/j. ophtha.2013.08.012. **5.** Korobelnik J-F, Do DV, Schmidt-Erfurth U, et al. Intravitreal aflibercept for diabetic macular edema. Ophthalmology. 2014;121(11):2247-2254. doi:10.1016/j.ophtha.2014.05.006. **6.** EYLEA 40mg/L solution for injection Prescribing Information Singapore, 8 Jan 2016.

ABBREVIATED PRESCRIBING INFORMATION

EYLEA SOLUTION FOR INJECTION IN VIAL 2MG. Approved name(s) of the active ingredient(s) One ml solution for injection contains 40 mg aflibercept. Each vial provides a usable amount to deliver a single dose of 50 µl containing 2 mg aflibercept. **Indication** EYLEA is indicated for the treatment of neovascular (wet) age-related macular degeneration (AMD), macular edema secondary to retinal vein occlusion (branch RVO or central RVO), diabetic macular edema (DME) and myopic choroidal neovascularization (myopic CNV). **Dosage Regimen *wAMD:*** The recommended dose for Eylea is 2 mg aflibercept, equivalent to 50 µl. EYLEA treatment is initiated with one injection per month for three consecutive months, followed by one injection every 2 months. There is no requirement for monitoring between injections. After the first 12 months of treatment with Eylea, the treatment interval may be extended based on visual and anatomic outcomes. In this case the schedule for monitoring should be determined by the treating physician and may be more frequent than the schedule of injections. ***Branch RVO or central RVO:*** The recommended dose for EYLEA is 2 mg aflibercept, equivalent to 50 microliters. After the initial injection, treatment is given monthly until visual and/or anatomic outcomes are stable. Three or more consecutive, monthly injections may be needed. The interval between two doses should not be shorter than one month. If there is no improvement in visual and anatomic outcomes over the course of the first three injections, continued treatment is not recommended. If necessary, treatment may be continued and the interval may be extended based on visual and/or anatomic outcomes (treat and extend regimen). Usually, monitoring should be done at the injection visits. During treatment interval extension through to completion of therapy, the monitoring schedule should be determined by the treating physician based on the individual patient's response and may be more frequent than the schedule of injections. ***DME:*** The recommended dose for EYLEA is 2 mg aflibercept, equivalent to 50 microliters. EYLEA treatment is initiated with one injection per month for five consecutive doses followed by one injection every two months. There is no requirement for monitoring between injections. After the first 12 months of treatment with EYLEA, the treatment interval may be extended based on visual and anatomic outcomes. The schedule for monitoring should be determined by the treating physician. If visual and anatomic outcomes indicate that the patient is not benefiting from continued treatment, EYLEA should be discontinued. ***Myopic CNV:*** The recommended dose for EYLEA is a single intravitreal injection of 2 mg aflibercept, equivalent to 50 microliters. Additional doses should be administered only if visual and anatomic outcomes indicate that the disease persists. Recurrences are treated like a new manifestation of the disease. The monitoring schedule should be determined by the treating physician based on the individual patient's response. The interval between two doses should not be shorter than one month. **Method of administration** Intravitreal injections must be carried out according to medical standards and applicable guidelines by a qualified physician experienced in administering intravitreal injections. Following intravitreal injection patients should be instructed to report any symptoms suggestive of endophthalmitis (e.g., eye pain, redness of the eye, photophobia, blurring of vision) without delay. Each vial should only be used for the treatment of a single eye. **Contraindications** Hypersensitivity to the active substance aflibercept or to any of the excipients, active or suspected ocular or periocular infection, active severe intraocular inflammation. **Special warnings and special precautions for use** Endophthalmitis, increase in intraocular pressure, immunogenicity, systemic adverse events including non-ocular haemorrhages and arterial thromboembolic events. As with other intravitreal anti-VEGF treatments for AMD, the safety and efficacy of Eylea therapy administered to both eyes concurrently have not been systematically studied. When initiating Eylea therapy, caution should be used in patients with risk factors for retinal pigment epithelial tears. The dose should be withheld and treatment should not be resumed earlier than the next scheduled treatment in the event of: a decrease in best-corrected visual acuity (BCVA) of ≥30 letters compared with the last assessment of visual acuity; a subretinal haemorrhage involving the centre of the fovea, or, if the size of the haemorrhage is ≥50%, of the total lesion area. The dose should be withheld within the previous or next 28 days in the event of a performed or planned intraocular surgery. EYLEA should not be used in pregnancy unless the potential benefit outweighs the potential risk to the foetus. Women of childbearing potential have to use effective contraception during treatment and for at least 3 months after the last injection of aflibercept. **Undesirable effects** *Very Common:* Conjunctival hemorrhage, eye pain. *Common:* Retinal pigment epithelial tear, detachment of the retinal pigment epithelium, retinal degeneration, vitreous haemorrhage, cataract (cortical, nuclear, subcapsular), corneal erosion, corneal abrasion, intraocular pressure increased, vision blurred, vitreous floaters or detachment, injection site pain, foreign body sensation in eyes, lacrimation increased, eyelid edema, injection site hemorrhage, punctate keratitis, conjunctival hyperemia, ocular hyperemia. **For a full listing of precautions and undesirable effects**, please refer to the full product insert. **For further prescribing information, please contact:** Bayer (South East Asia) Pte Ltd 63 Chulia Street OCBC Centre East 14th Floor Singapore 049514. **Date of revision of text** 16 May 2016.

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WELCOME MESSAGE

Dear Friends and Colleagues

I am delighted to welcome you to Singapore to the 3rd Asia-Pacific Tele-Ophthalmology Society Symposium.

This year's symposium has been themed "Big Data Analytics and Artificial Intelligence Evolution in Ophthalmology", with the aim of show casing how the cutting edge developments in information technology are changing the evolution of tele-ophthalmology and the practice of ophthalmology in general.

APTOS, through the founding leadership of Prof Mingguang He, has been one of the pioneering efforts globally at promoting the development of the use of information technology in tele-ophthalmology in order to improve care, access and screening of patients with eye diseases.

Our scientific program committee have put together an exciting line up of keynote and invited speaker from around the globe and we look forward to an informative, interesting and interactive meeting which will maximize engagement of both the delegate and faculty and a manner which will promote the use and progress of teleophthalmology in Asia.

I would like to express my heart felt appreciation for the Congress organizing committee and team, as well as the scientific program committee for their unwavering committment in bringing the best possible program and meeting to APTOS Singapore 2018.

The congress would also not be possible without the generous support and contribution from our corporate sponsors and partners from the public and private sectors, and I would like the personally thank them for role in the success of this meeting

Finally, Singapore is a dynamic and connected city state, with a plethora of cultural and leisure attractions and a famed culinary heritage which should provide delegates with a feast of entertainment and gastronomic delights. We look forward to you participating in our social program and taking the opportunity to taste what our lovely island has to offer.

My team and I look forward to meeting you at the APTOS symposium and hope you will enjoy your weekend in Singapore.

Yours sincerely,

DR GAVIN TAN
Congress President, 3rd APTOS Symposium
Council Member, APTOS

WELCOME MESSAGE

Dear Friends and Colleagues

On behalf of the Singapore National Eye Centre and Singapore Eye Research Institute, it gives me great pleasure to welcome all of you to APTOS 2018.

SNEC and SERI together continuously innovate to remain at the forefront of ophthalmology and the visual sciences. With eye care now evolving even more rapidly, we have taken the opportunity to host this meeting which is quite unlike most medical and research meetings but one that looks to the future where Artificial Intelligence, Machine Learning, Big Data will be common buzzwords and have a fundamental role in patient care.

The possibilities are endless and the future is exciting. The new technology and its applications will help us understand disease trends better, make informed decisions thereby improving outcomes and even increase research efficiency – together these will transform how we practice medicine.

I would like to thank the faculty for being here to share your expertise and insights. For the participant, do have lively discussions on these new sciences while developing new friendships and networks. We are also pleased to host you to a Welcome Reception where you will get to taste local gastronomical delights and at the same time get to view our clinical and research facilities.

I look forward to meeting with you.

Yours sincerely,

PROF WONG TIEN YIN
Medical Director, Singapore National Eye Centre
Vice-Dean, Office of Academic and Clinical Development, Duke-NUS Medical School
Deputy Group CEO (Research and Education), SingHealth

WELCOME MESSAGE

Dear Friends and Colleagues,

It is with immense pleasure that we celebrate the 2nd anniversary of the Asia Pacific Tele-Ophthalmology Society (APTOS) at its 3rd Annual Symposium. I am extremely pleased to witness that the applications of diagnostics and treatment assisted by artificial intelligence (A.I.) have been embraced by more and more ophthalmologists worldwide and A.I. is no longer a buzzword. While for some ophthalmologists, they are still at sea, deciding whether A.I. is a friend or a foe. For many of us who have a positive outlook on A.I. clearing the backlog of undiagnosed preventable blinding eye diseases, we will remain steadfast in teaching our machines to learn to diagnose, and even treat, more and more eye diseases with greater and greater accuracy by enhancing and fine-tuning our algorithms and enlarging our data pool. This cannot be done by computer scientists alone. The input of ophthalmologists and service providers is of great importance. After all, computers need our commands and data, and are as clever as we teach them to be.

We know that convolutional neuron network may look like a black box or just a very bizarre phrase to many ophthalmologists. Therefore, APTOS is organizing an A.I. workshop that enables ophthalmologists with no or minimal knowledge of machine learning to learn to create their own A.I. diagnostic tool. No one will have to do the job of a data engineer in order to create their own A.I., paving the way for more and more ophthalmologists to contribute to the development of tele-ophthalmology enabled by A.I. and big data analytics. What's more, APTOS is going to organize its inaugural Big Data Challenge in the next annual meeting in Chennai, India, to help nurture a generation of tele-ophthalmologists who are not only hard-working and patient-centered, but also work smart to leverage technological advances to achieve more, serve more and save more.

I would like to specifically thank the Scientific Program Chairs for putting together a world-class program, covering every aspect of tele-ophthalmology and tele-medicine. You will certainly be impressed by the unparalleled, content-rich presentations that are unique to the APTOS annual symposium. I would like to thank the Organizing Committee for their dedications to making the 3rd APTOS Symposium another great success, in particular the Singapore National Eye Centre for making the tele-ophthalmology clinic tour possible.

I wish you a wonderful time in Singapore and look forward to meeting every one of you during our 2-day program packed with networking opportunities.

Yours sincerely,

MINGGUANG HE, MD, PHD
President
Asia Pacific Tele-Ophthalmology Society

WELCOME MESSAGE

Dear Friends and Colleagues,

On behalf of the Asia Pacific Teleophthalmology Society (APTOS), I welcome you to the 3rd APTOS Symposium.

Following the Inaugural Symposium of APTOS in Beijing in 2016, and the 2nd Symposium in Hong Kong last year, I am now very pleased to welcome you to the 3rd Symposium, hosted by the Singapore National Eye Centre (SNEC).

The themes of this year's symposia reach from artificial intelligence (AI) and teleophthalmology to big data and mobile devices, covering current trends in the digital health space. As AI is fast moving towards becoming mainstream in health care, it is increasingly solving problems such as clinician shortages and an ageing population. In many parts of the world, patient video visits are now a common model of service delivery, proving to be convenient, cost-effective and of quality that is comparable with in-person care. At the same time, data generated from wearables and mobile devices is increasing in reliability, emphasizing its value and the need for integration.

As last year, I encourage you to join the popular APTOS Roundtable. This year, discussion will focus on AI and Big Data in Ophthalmology.

Symposium abstracts will be available on the SingHealth Events App, which can be found on Apple App Store and Android Play Store.

For now, I wish you an interesting and successful 3rd APTOS Symposium.

Yours sincerely,

DR ANDREAS MUELLER
Asia Pacific Teleophthalmology Society Secretary General

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DR RICHARD FAN LECTURESHIP

In late 2015, the Singapore National Eye Centre (SNEC) was bestowed an endowment by Dr Richard Fan, in support of the annual Richard Fan Distinguished Lectureship, to be awarded to outstanding and world-renowned academics in the field of Ophthalmology and Visual Sciences. The awarded lecturer serves as an inspiration and he/she shall be a role model to all.

Dr Richard Fan, the former Head of both the Ophthalmology departments of the Tan Tock Seng Hospital and Singapore General Hospital, and the late Professor Arthur Lim shared the vision of a tertiary ophthalmology center of excellence, with the result being the SNEC of today. With the establishment of the SNEC, Dr Fan was appointed as founding member to both the SNEC Board of Directors and Medical Board, and has provided his unwavering support to the national development of SNEC. Dr Fan also played an integral part in the development of the Singapore National Eye Centre and has mentored and inspired a generation of ophthalmologists in Singapore.

Prof Mingguang HE, MD PHD MPH FRANZCO
Professor
University of Melbourne
Australia

Prof. Mingguang He is currently Professor of Ophthalmic Epidemiology at the University of Melbourne and Centre for Eye Research Australia, Director of WHO Collaborating Centre for Prevention of Blindness (Australia). He is a Fellow of Royal Australian and New Zealand College of Ophthalmologists. He was the former Associate Director and Professor of Ophthalmology in the Zhongshan Ophthalmic Center, Sun Yat-sen University in Guangzhou.

He graduated from Sun Yat-sen University of Medical Sciences and got degrees of Doctor of Medicine and Doctor of Philosophy. He received his research training in Johns Hopkins University (MPH) and University College London (MSc. PhD).

His research interest includes clinical and epidemiological research, randomized clinical trial, twin study, imaging technology and big data research. He ran the first population-based study on glaucoma in mainland China and further epidemiological studies on refractive error, presbyopia and other eye diseases. He established several large cohort studies including the Guangzhou Government Servant Eye Study, Chinese High Myopia Registry and Guangzhou Twin Eye Registry. He ran a clinical trial on prophylaxis of angle closure in Chinese people with 4 years follow-up. From 2009 to 2013 he ran a clinical trial to investigate the impact of outdoor intervention on the control of myopia and the results was published in the American Medical Association (JAMA) in 2015. During the recent years, he has been dedicated in inventing and applying devices that facilitate the diagnosis and surgery of eye disease, like fundus photo auto-grading system with Artificial Intelligence and Deep learning technology, visual accuracy self-assessment.

He has published nearly 280 papers in the international peer-reviewed journals including JAMA, Ophthalmology, British Journal of Ophthalmology, Invest Ophthalmology and Vision Science and some important book chapters, with more than 9000 citations. The current H-index is 47. He has been awarded more than 20 grants from Chinese, Australia and other international funding bodies and is currently holding 17 patents. He has given more than 90 invited lectures at Asia regional and international conferences.

He serves as editorial board member for several important journals, including the Ophthalmology, the Top 1 ophthalmology journal, and deputy editor of Eye Science. He serves as President of Asia Pacific Tele-Ophthalmology Society (APTOS), Deputy Secretary-General of Asia-Pacific Academy of Ophthalmology (APAO),

Director of Preventive Ophthalmology Panel, Chinese Ophthalmological Society, and Country Director of Helen Keller International. He has received several awards including a distinguished young scholar award from the National Natural Science Foundation of China (2011) and Holmes Lecture Award from the Asia-Pacific Academy of Ophthalmology (2015).

ARTIFICIAL INTELLIGENCE IN REAL WORLD SCREENING

Synopsis

Professor He, together with technology company Healgoo Interactive Med Tech, invented EyeGrader, a deep learning-based grading system for the detection of referable diabetic retinopathy, glaucoma, late age-related macular degeneration and cataract from standard colour fundus photographs. To promote the real-world application of this technology, his ongoing research has led to the development of a fully functioning, web-based and offline clinician interface, with integrated, automated diagnosis and immediate output of a single page grading report. This system has been widely adopted in the Lifeline Express DR screening program in China, and with support from the BUPA Health Foundation and Medical Research Future Fund, his current research in Australia focusses on the assessing the impact, end-user acceptance and cost-effectiveness of this technology as a novel point-of-care screening model for use within endocrinology and primary care settings. This solution offers significant potential benefits including an increased efficiency, accessibility and affordability of eye disease screening programmes.

KEYNOTE SPEAKERS & SYNOPSIS

A/Prof Lama AL-ASWAD
Associate Professor of Ophthalmology
Director, Tele-ophthalmology Initiative
The Edward S. Harkness Eye Institute
Columbia University Medical Centre
United States

Dr Lama A. Al-Aswad is an ophthalmologist with subspecialty in glaucoma and cataract with a strong interest in disease prevention and population health management. She is an Associate Professor of Ophthalmology at Columbia University, Glaucoma fellowship director, Chair of quality assurance of the Eye Institute and the Director of the Tele-ophthalmology initiative. Dr Al-Aswad received her medical degree from Damascus University Medical School and a Glaucoma research fellowship from Mass Eye and Ear infirmary Harvard Medical School. She completed her Residency in ophthalmology at SUNY Downstate and her Glaucoma fellowship at UT Memphis. Dr Al-Aswad is a Board certificated ophthalmologist, the past president of the NY Glaucoma Society and the current president for the Women in Ophthalmology. She is an active member of several professional societies. In 2015, Dr Al-Aswad was also conferred the degree Master of Public Health from Columbia University, Mailman School of Public Health for her work in healthcare policy and management.

Dr Al-Aswad's dedication to science and the scientific method is evident from her list of scientific publications, book chapters, invited articles and a large number of scientific presentations at national and international meetings. Dr Al-Aswad is a believer in prevention of blindness as evident from her large-scale glaucoma screening project in NYC where she screened more than 8500 individuals for glaucoma. She recently launched the tele-ophthalmology screening project for the four-leading cause of blindness using a mobile tele-ophthalmology unit equipped with state of the art devices and staffed with technicians, linked in real-time to a reading center. Dr Al-Aswad is currently working on validating artificial intelligence systems in glaucoma and diabetic retinopathy screening as a tool in blindness prevention.

TELE-OPHTHALMOLOGY AND ARTIFICIAL INTELLIGENCE

Synopsis

Tele-medicine, or tele-health, refers to the practice of medicine at a spatial and/or temporal distance by exchanging medical information via electronic communications. Tele-health and artificial intelligence are gaining ground as new innovations shaping the future of medicine. The practice of ophthalmology lends itself to the practice of tele-medicine through its heavy reliance on imaging. With the advancing technology and high-speed connectivity tele-ophthalmology and artificial intelligence are poised to transform ophthalmology into large interconnected systems and to improve the efficiency, quality, outcomes, and accessibility to healthcare, while decreasing costs.

Access to care is problematic in high risk and underserved communities in New York City due to multitude of reasons. In our study published in 2017 (Screening for glaucoma in populations at high risk: The eye screening New York project) we found that 57% of the screened individuals never saw an eye doctor in their lifetime regardless of having insurance. Subsequently we initiated a study to screen for the four-leading cause of blindness using a mobile tele-ophthalmology unit equipped with state of the art devices and staffed with technicians, linked in real-time to a reading center. Our pilot study had a high rate of disease detection when used in high risk communities. This initial experience establishes the feasibility of mobile tele-ophthalmology as a method of facilitating access to care. Furthermore, it highlights the importance of an active blindness prevention program in the context of population management.

Artificial intelligence algorithms using deep learning are showing great promise in medicine. Artificial algorithm based on deep machine learning had high sensitivity and specificity for detecting referable diabetic retinopathy. The FDA recently approved IDx-Dr AI based diagnostic system for the autonomous detection of diabetic retinopathy. Recently we validated the use of Pegasus Deep Learning System (PDLS) in identifying glaucomatous optic damage on disc photos when compared to a reference standard comprised of expert graders. The PDLS achieved an AUC-ROC of 83% ($P<0.05$) with sensitivity of 96.1% and specificity of 58.3%. Its high sensitivity suggests potential utility for glaucoma screening in settings where specialists are not available, including tele-medicine programs.

Dr Gil BINENBAUM
Richard Shafritz Endowed Chair of Ophthalmology Research
Attending Surgeon, Division of Ophthalmology, The Children's Hospital of Philadelphia
Associate Professor, Ophthalmology, Perelman School of Medicine of the University of Pennsylvania
United States

Gil Binenbaum MD MSCE is the Richard Shafritz Endowed Chair of Ophthalmology Research and Attending Surgeon in the Division of Ophthalmology at The Children's Hospital of Philadelphia, and Associate Professor of Ophthalmology at the Perelman School of Medicine of the University of Pennsylvania, in the United States. He completed medical school, residency, fellowship, and graduate studies in clinical epidemiology and biostatistics at these same institutions. One of his primary research interests is retinopathy of prematurity, for which he is Chair of an international, multicenter ROP research group funded by the National Institutes of Health; their goal is to use biomarkers such as postnatal growth to improve prediction of ROP risk and increase the efficiency of ROP screening. Another major research interest is mechanisms and patterns of intraocular injury in pediatric head trauma, the goal of which is to improve the accuracy of the diagnosis of child abuse. Dr Binenbaum is a research and clinical mentor for students, at all levels of training, from college and medical school to residency and fellowship. His clinical practice specializes in pediatric and adult strabismus surgery, retinopathy of prematurity diagnosis and treatment, and consultative pediatric ophthalmology.

CLINICAL APPLICATIONS AND CONCEPTS OF CLINICAL PREDICTION MODEL DESIGN

Synopsis

Retinopathy of prematurity (ROP) is an important cause of blindness in premature infants throughout the world. Current clinical management consists of screening, decisions for which are typically based on only birth weight and gestational age at birth; diagnosis by ophthalmologist examination, which in some hospitals is triggered by preceding retinal image grading; and treatment with laser photocoagulation or intravitreal injection of anti-vascular endothelial growth factor agents, to prevent progression to retinal detachment. Current ROP screening guidelines, based on studies of high-risk infants and expert opinion, have low specificity for disease requiring treatment. Based upon advances in the understanding of the pathogenesis of ROP, numerous postnatal-weight-gain-based models have been developed to improve the specificity of ROP screening, but these models have been limited by complexity and small development cohorts, which result in model overfitting and resultant decreased sensitivity in validation studies. To overcome these limitations, the postnatal growth and ROP (G-ROP) collaborative study group has recently carried out two large-scale multicenter studies to develop and validate a clinically implementable, birth weight, gestational age, and weight-gain prediction model, which takes the form of modified ROP screening criteria. In this presentation, we will discuss principles of clinical predictive models and demonstrate these principles using the G-ROP Studies and preceding ROP predictive model studies. The story of these models demonstrate how large amounts of detailed clinical data can help to guide clinical practice, not only improving the efficiency of care but also potentially allowing screening practices to be updated in response to changes in care that directly impact the profile of infants at risk for ROP, if data registries contain sufficiently detailed medical information. The models highlight the fundamental importance of dataset size in the development of clinical prediction tools. The G-ROP Studies datasets also can be used to study ophthalmologist practice patterns and produce evidence-based examination schedules. Finally, these approaches can be integrated into a hybrid system, in which predictive modelling is combined with telemedicine to accurately, promptly, and more efficiently identify infants who develop severe ROP and require referral to an ophthalmologist for possible treatment.

Dr Philippe BURLINA
Johns Hopkins University
United States

Dr Phil Burlina holds joint faculty positions at the Johns Hopkins University School of Medicine Wilmer Eye Institute, the Malone Center for Healthcare Engineering and the Department of Computer Science. He is a principal scientist with the Johns Hopkins University Intelligent Systems Center at the Applied Physics Laboratory. Dr Burlina's research spans several areas of machine intelligence including machine learning, deep learning, machine vision, object detection and recognition, deep reinforcement learning, medical image diagnostics, and addressing problems of making AI work in the wild such as zero/one/adaptive shot learning and unsupervised learning. His interests are in the development AI algorithms that are impactful for problem areas in medicine, robotics, and autonomous navigation.

RECENT DEVELOPMENTS IN DEEP LEARNING AND APPLICATIONS TO HEALTHCARE AND RETINAL IMAGING

Synopsis

In this presentation we will review the latest development in deep learning and look at their recent applications and future impact on retinal image analysis in tasks such as prognosis and diagnosis as well as other AI applications to healthcare and medical image analysis, and will conclude by providing perspectives on clinical deployments.

Prof Michael CHIANG
Knowles Professor, Departments of Ophthalmology & Medical Informatics and Clinical Epidemiology,
Vice-Chair (Research), Department of Ophthalmology
Oregon Health & Science University (OHSU) Casey Eye Institute
United States

Michael F. Chiang, MD, is Knowles Professor of Ophthalmology & Medical Informatics and Clinical Epidemiology at the Oregon Health & Science University (OHSU) Casey Eye Institute, and is Vice-Chair (Research) in the ophthalmology department. His clinical practice focuses on pediatric ophthalmology and strabismus. He is board-certified in clinical informatics, and is an elected Fellow of the American College of Medical Informatics. His research has been NIH-funded since 2003, and involves applications of telemedicine, clinical information systems, computer-based image analysis, and genotype-phenotype correlation to improve delivery of health care. His group has published over 140 peer-reviewed journal papers. He directs an NIH-funded T32 training program in visual science for graduate students & postdoctoral fellows at OHSU, directs an NIH-funded K12 mentored clinician-scientist program in ophthalmology, and teaches in both the ophthalmology & biomedical informatics departments. Before coming to OHSU in 2010, he spent 9 years at Columbia University, where he was Anne S. Cohen Associate Professor of Ophthalmology & Biomedical Informatics, director of medical student education in ophthalmology, and director of the introductory graduate student course in biomedical informatics.

Dr Chiang received a B.S. in Electrical Engineering & Biology from Stanford University, and an M.D. from Harvard Medical School & the Harvard-MIT Division of Health Sciences and Technology. He received an M.A. in Biomedical Informatics from Columbia University, where he was an NLM fellow in biomedical informatics. He completed residency and pediatric ophthalmology fellowship training at the Johns Hopkins Wilmer Eye Institute. He is past Chair of the American Academy of Ophthalmology (AAO) Medical Information Technology Committee, Chair of the AAO IRIS Registry Data Analytics Committee, member of the AAO IRIS Registry Executive Committee, and member of the AAO Board of Trustees. He is Associate Editor for the Journal of the American Medical Informatics

Association (JAMIA), Associate Editor for the Journal of the American Association for Pediatric Ophthalmology & Strabismus, and serves on the Editorial Boards for Ophthalmology, Ophthalmology Retina, Asia-Pacific Journal of Ophthalmology, and EyeNet. He has received "Top Doctor" awards from Castle Connolly, Best Doctors in America, and Portland Monthly magazine, and has received numerous research and teaching awards.

TELE-MEDICINE AND ARTIFICIAL INTELLIGENCE FOR RETINOPATHY OF PREMATURITY: EVOLUTION IN THE STANDARD OF CARE

Synopsis

One of the major areas in ophthalmology where the application of telemedicine and artificial intelligence has been proposed is retinopathy of prematurity (ROP). This talk will discuss challenges in traditional ROP management, ways in which telemedicine has potential to improve the quality and delivery of care by addressing these challenges, and the published evidence to date. We will then discuss challenges in ROP diagnosis, ways in which artificial intelligence methods have potential to make diagnosis more objective and quantitative, and the published evidence to date. This talk will conclude by summarizing how ROP care is evolving because of these technologies.

Dr Jochen KUMM
CEO, Pr3vent
Visiting Scholar, Department of Ophthalmology, Stanford University School of Medicine
United States

Jochen Kumm is the CEO of Pr3vent, a universal screening company. He is a Visiting Scholar in the Department of Ophthalmology at the Stanford University School of Medicine. He is originally geneticist and a mathematician focused on healthcare applications of Deep Learning and AI. He is a sequential founder/advisor of start-ups that operate in Europe, North America and Asia including NextBio, Pathogenica, Veracyte, Pinpoint Science and insightAI, and hold multiple patents in diagnostics and AI.

Educated at Harvard University and Stanford University, he worked at the Department of Statistics at the University of Washington and at the UW Genome Center. At Roche Pharmaceuticals he was – as head of Computational Biology - global technology lead for genomics. Subsequently, he led biomathematics at the Stanford Genome Technology Center for a decade. In collaborations with Harvard, MIT, UCSF, UCSC, the CDC and others, Dr Kumm has developed tools used by the CDC, biotech, financial institutions and the British Home Office. More recently, he worked for IBM Research and IBM Watson developing large-scale healthcare solution.

A CLINICAL AI SYSTEM FOR IDENTIFYING NEWBORN INFANTS AT RISK OF VISION LOSS

Synopsis

A total of 5% of newborns have potentially treatable pathology present that can result in vision loss and blindness. Diseases are diverse ranging including retinal detachment, blastomas and many others. We detect abnormalities related to these events in images of the newborn retina and the eye.

Newborn eye screening in newborns can be done with photographic screening in the first 48-72 hours of birth, while the infant is still in the hospital. In fact, we know that fundus hemorrhages are most easily detected in this time period, rapidly dropping off over the next 4 weeks. The same is true for non-hemorrhagic, non-amblyogenic, defined diagnosis vision threatening pathology in 1.5-2.5% of newborns.

For universal screening ~4 million newborns, i.e. 50 million images, must be screened annually in the US. We are deploying an AI system that can perform such screening with high accuracy.

Upon detection of abnormality the system alerts the clinic to initiate referral within 1 week after birth, which is comfortably within the effective treatment window to prevent vision loss.

Deep learning architectures were optimized to develop the Pr3Novo™ Classifier to detect abnormality in healthy term newborn retinal images. Deep learning using neural network has been successfully applied to image analysis and has been used to classify adult retinal images for macular degeneration, glaucoma and diabetes. With training set of 5000 scored images we identified than 89% of abnormal images. Retina specialists will curate a larger portion of Pr3vent's in-house database of ~250,000+ newborn eye examination images to enable significant increase in accuracy. Further work has added the ability to detect abnormality in images of healthy term newborn eyes (anterior segment images). Similar approaches requiring a curated training set of 3000 patient samples with >6,000 curated images have proved effective.

The AI system presented here is scalable and follows a single regulatory pathway to provide nationwide service. It performs at a level comparable to a specialized pediatric opthamologist, nearly eliminates human error and has significant economic and health impact.

Dr Lily PENG
Product Manager
Google
United States

Lily Peng a non-practicing physician and product manager for a team that works on applying deep learning to medical data, especially medical imaging. Here are some of her team's recent work in diabetic eye disease (JAMA & TensorFlow Dev Summit) and pathology.

Before Google, Dr Peng was a product manager at Doximity, the "linkedin" for physicians, and a co-founder of Nano Precision Medical (NPM), a medical device start-up developing a small implantable drug delivery device. She completed her M.D. and Ph.D. in Bioengineering at the University of California, San Francisco and Berkeley. Dr Peng received her B.S. with honors and distinction in Chemical Engineering from Stanford University.

DEEP LEARNING SYSTEM FOR RETINAL IMAGING

Synopsis

Deep learning is a family of machine learning techniques in which multiple computational units, organized in layers, work together to model complex systems with high accuracy by learning from examples. Deep convolutional neural network is a specific subtype of deep learning optimized for images. This technique has produced algorithms that can diagnose melanoma, breast cancer lymph node metastases and diabetic retinopathy from medial images with comparable accuracy to human experts. This talk covers work in applying deep learning to retinal imaging for diabetic retinopathy, including recent work in using different reference standards and techniques to improve explainability. It will also cover how retinal images and deep learning can be leverage to make novel predictions such as cardiovascular risk factors.

Prof Ningli WANG
Professor & Director
Beijing Tongren Eye Center
China

The retina is the only tissue in the body that allows observation blood vessels in vivo. Diagnosis of and screening for retinal diseases (such as DR and glaucoma) and chronic diseases (such as hypertension and stroke) can be achieved by detecting pathological changes of the retina.

Beijing Shanggong Medical Technology Co., Ltd, in collaboration with the National Engineering Research Center for Ophthalmic Equipment, has developed AutoEye, an intelligent fundus image analysis platform. The platform is a fusion of an AI-based automatic retinal disease analysis algorithm and a hospital-oriented fundus screening system. We have studied key technologies of fundus image analysis, and developed total solutions to automatic fundus image analysis for detecting various retinal diseases.

At present, AutoEye has been used in over 300 hospitals nationwide and has gradually established large data of fundus images in China.

FUNDUS SCREENING AND DIAGNOSIS WITH AI IN CHINA

Synopsis

The retina is the only tissue in the body that allows observation blood vessels in vivo. Diagnosis of and screening for retinal diseases (such as DR and glaucoma) and chronic diseases (such as hypertension and stroke) can be achieved by detecting pathological changes of the retina.

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At present, AutoEye has been used in over 300 hospitals nationwide and has gradually established large data of fundus images in China.

SYMPOSIUM SPEAKERS & SYNOPSIS

Dr T C Ganesh BABU, MD
Head - Clinical & Regulatory Affairs
CARIn Division
Carl Zeiss India (Bangalore) Pvt. Ltd.
India

Ganesh Babu is a Medical Doctor with Masters in (MD) in Clinical Research & Pharmacology, a seasoned professional with over 17 years of experience in medical device & pharma industry.

Heading Clinical & Regulatory Affairs at Center for Applications & Research, India (CARIn) division of Carl Zeiss India, he is responsible for developing clinical strategies clinical /application workflows for product usage, define & validate clinical claims for regulatory approvals & achieve marketing authorizations, plan supervise and conduct clinical studies, guide & design clinical reviews and support clinical investigators in publishing research work in indexed journals – for medical devices developed in CARIn.

His key achievements would include holding a USA Patent as "individual inventor" for invention titled "Mapping of Clinical Findings in Fundus Images to Generate Patient Reports". He also modelled Bangalore R&D as the first center of excellence in ZEISS group to develop software as standalone medical product based on Artificial Intelligence (AI) for screening Diabetic Retinopathy.

VISUHEALTH – AN EVOLVING ECOSYSTEM FOR DIABETIC RETINOPATHY SCREENING USING VISUSCOUT 100 – A HANDHELD NON-MYDRIATIC DIGITAL FUNDUS CAMERA OVER A CLOUD-BASED AI ENABLED PLATFORM

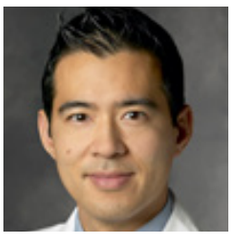
Synopsis

VISUHEALTH (Carl Zeiss Meditec.,) is a CE approved Class I device, it is a Collaboration Platform which uses a cloud based telescreening framework and introduces an end-to-end eye screening solution. It has capability of facilitating screening by manual graders as well by automated retinal image analysis. Workflow is by uploading retinal images of patients to a central storage for review & reporting by ophthalmologists / trained human graders or for review & reporting by automated retinal image analysis and delivering clinical reports back to the respective acquisition centres.

VISUHEALTH comprises of –

- Web / Mobile interfaces to acquisition and uploading images to CP
- Reading and reporting application for Ophthalmologists to deliver reports back to image acquisition centers
- VISUHEALTH – Automatic DR Screening Solution (Automated retinal image analysis system for detection of DR, a CE approved Class I standalone software as medical device) and reporting application which can deliver reports back to image acquisition centres

VISUHEALTH solution using a single nonmydriatic digital photograph of the macula and disc has achieved acceptable sensitivity for referable retinopathy compared with that of human graders (Retina specialists), at a level of specificity that makes it even more cost-effective alternative to a purely manual grading of DR by trained readers. VISUHEALTH – Automatic DR Screening Solution shown to be effective in this study has the potential to support the impending challenge of DR screening in developed, as well as developing, countries. Introducing VISUHEALTH in these settings could help scale eye-screening delivery programs.



Dr Robert CHANG
Medical Innovator & Assistant Professor
Department of Ophthalmology
Byers Eye Institute, Stanford University
United States

Professor Chang is a medical innovator and an assistant professor of ophthalmology at the Byers Eye Institute at Stanford University. As a Bascom Palmer-trained glaucoma specialist and refractive cataract surgeon, Dr Chang teaches the latest minimally invasive glaucoma techniques as well as state-of-the-art premium IOL and complex cataract management. He is co-inventor of the PAXOS scope and helped develop the normative databases of the Zeiss OCT Stratus and Cirrus. Currently, he is Vice President of the Asia Pacific Tele Ophthalmology Society and is leading efforts in Artificial Intelligence Deep Learning, with research interests covering glaucoma in high myopia, patient satisfaction surveys, tools for glaucoma compliance, portable imaging, wearables, digital health, and medtech entrepreneurship education.

WHAT IS BLOCKCHAIN TECHNOLOGY?

Synopsis

This talk will explain blockchain and how it works, IPFS, cryptocurrency, ICO, and basically how all this relates to healthcare, big data, and training AI.

Prof CHENG Ching-Yu
Associate Professor, Duke-NUS Medical School
Principal Clinician Scientist, Singapore Eye Research Institute (SERI)
Senior Clinician Scientist, Singapore National Eye Centre (SNEC)
Singapore

Dr Cheng Ching-Yu is an Associate Professor at Duke-NUS Medical School, Principal Clinician Scientist at Singapore Eye Research Institute and Senior Clinician Scientist at the Singapore National Eye Centre. He completed his MPH and PhD from Johns Hopkins University, and received his fellowship training in Preventive Ophthalmology at Wilmer Eye Institute. His current research work involve in a variety of epidemiological and clinical research related to age-related ocular diseases, such as glaucoma and age-related macular degeneration, as well as identification of susceptibility genes for ocular diseases, using both genome-wide association approaches and next-generation sequencing. As Co-Director of the Singapore Epidemiology of Eye Diseases (SEED) program, A/Professor Cheng and his team have built up one of the largest epidemiological databases (n >10,000) for eye diseases in the world. He has published more than 250 scientific papers, included those in Nature Genetics, Lancet Global Health and Ophthalmology. A/Professor Cheng's honors include the prestigious Clinician Scientist Awards from the Ministry of Health NMRC in 2013 and 2017, and the Asia-Pacific Academy of Ophthalmology (APAO) Achievement Award and Outstanding Service in Prevention of Blindness Award.

APPLICATION OF MACHINE LEARNING IN GENOMIC DATA

Synopsis

Machine learning algorithms are increasingly being applied to genomic research. It offers promising computational and analytical solutions for the integrative analysis of large and heterogeneous genomic datasets. This presentation will introduce the basic concepts of machine learning algorithms and briefs how machine learning could interface with Big Data analytics to facilitate genomic research.

Dr Carol Y. CHEUNG
Assistant Professor
Department of Ophthalmology and Visual Sciences
The Chinese University of Hong Kong
Hong Kong

Dr Carol Y. Cheung is an Assistant Professor at Department of Ophthalmology and Visual Sciences, the Chinese University of Hong Kong. Dr Cheung's main research interest is "imaging of the eye", based on the concept that the eyes are the "window" to the human circulation and nervous systems. Changes in the retinal blood vessels and the optic nerve mirror parallel changes in the brain and other organs in the body and can now be imaged using new technology easily. Dr Cheung's work entails the development and application of ocular imaging for studying eye and brain diseases including diabetic retinopathy, glaucoma, Alzheimer's disease and stroke. Dr Cheung is a council board member and treasurer of Asia Pacific Tele-Ophthalmology Society. She is also a secretary-general of Asia Pacific Ocular Imaging Society, and a secretary of Research Standing Committee, Asia-Pacific Academy of Ophthalmology.

THE POTENTIAL OF RETINAL IMAGING TO SCREEN FOR ALZHEIMER'S DISEASE

Synopsis

The retina - due to its anatomical, embryological and physiological similarities with the brain - offers a unique and accessible "window" to study correlates and consequences of subclinical pathology in the brain. Retinal components such as the microvasculature and retinal ganglion cell axons can now be visualized non-invasively using different retinal imaging techniques e. Advances in retinal imaging may provide new and potentially important insights into cerebrovascular neurodegenerative processes in addition to what is currently possible with neuro-imaging. In this talk, Dr Cheung will present an overview of the current literature on imaging retina to study dementia and its potential to screen for Alzheimer's Disease.

Dr Mohamed DIRANI
Managing Director, plano Pte Ltd
Adjunct Research Fellow, Singapore Eye Research Institute (SERI)
Singapore

Dr Mo Dirani is the founding Managing Director of plano Pte Ltd and an adjunct Research Fellow at the Singapore Eye Research Institute (SERI), Singapore. Mo completed his PhD at the age of 25 years (2006), where he established the world's largest twin study to investigate the genetic and environmental risk factors of myopia. In 2008, Mo undertook a post-doctoral appointment at the National University of Singapore (NUS), where he co-led a study that produced one the first and most cited scientific papers that provided novel insights into the protective nature of outdoor activity in the development of myopia. Since completing his PhD, Mo has published over 100 peer-reviewed manuscripts in prestigious medical journals, has been an invited speaker across the globe as an expert in myopia, published several Government commissioned reports and has received several competitive scholarships, fellowships and scientific awards. More recently (2015-2017), Mo led Australia's first nation-wide study to assess the burden of blindness in indigenous and non-Indigenous Australians, completed his MBA at the Australian Institute of Business (AIB) and is a graduate from the Australian Institute of Company Directors (AICD). Mo currently resides in Singapore, where plano was conceptualised and developed. In his own words, "you develop a great sense of purpose when your research work is being applied to solve the growing global public health concerns of excessive smart device use in children and the projected epidemic of myopia". Mo is an avid runner, with his 11th marathon completed in Singapore (Standard Chartered Singapore Marathon, 2017) where he raised substantial funds to grant a young boy with his wish of having a motorised wheelchair.

PLANO – USE OF MOBILE DEVICES IN EYE CARE

Synopsis

Plano is an innovative software application that manages smart device use and myopia in children. plano's digital platform captures representative data on myopia, utilization of optometry services and device use behavior. In partnership with Singapore's Health Promotion Board (HPB), plano will assist in the screening, early detection and management of myopia in Singaporean children nationwide. This presentation will report the aggregate analysis on myopia captured from plano's database between November 2017 to May 2018.

Dr Malvina B EYDELMAN
Director, Division of Ophthalmic and Ear, Nose & Throat Devices
FDA
United States

Dr Eydelman is a board-certified ophthalmologist. She received her undergraduate degree in Electrical Engineering, with a focus on Biomedical Engineering, from The Cooper Union for the Advancement of Science and Art. She received her M.D. degree from Harvard Medical School and a Doctorate in Health Sciences and Technology from Massachusetts Institute of Technology (M.I.T.).

In 1995, Dr Eydelman joined FDA. For over 20 years, as an Expert Medical Officer, Senior Medical Advisor, Director of FDA's Division of Ophthalmic, Neurological and Ear, Nose and Throat Devices (DONED) and Director of the FDA's Division of Ophthalmic and Ear, Nose and Throat Devices (DOED), Dr Eydelman has played a key role in assuring the safety and effectiveness of medical devices. She has been actively involved in standardization of ophthalmic devices as the U.S. Expert Delegate to the International Standards Organization and FDA's Liaison to the American National Standards Institute's Committee for Ophthalmic Devices. Dr Eydelman has served as the Principal Investigator for several clinical and laboratory studies. She has spearheaded numerous initiatives

designed to improve the safety and effectiveness of medical devices. Dr Eydelman originated many symposia and workshops to facilitate medical device innovation. Her broad interests have resulted in a United States patent, numerous publications, and many speaking engagements.

REGULATION TO FOSTER WORLDWIDE DIGITAL HEALTH INNOVATION (FDA)

Synopsis

The International Medical Device Regulators Forum (IMDRF) is a voluntary group of medical device regulators from around the world who have come together to accelerate international medical device regulatory harmonization and convergence. United States Food and Drug Administration (FDA) is a member of IMDRF and led the development of Software as a Medical Device (SaMD) Working Group (WG). This group identified commonalities, established a common vocabulary and developed approaches for appropriate regulatory controls that promote prospective convergence in areas of advanced and innovative technologies in this topic area. SaMD WG has published the following documents: Key Definitions; Possible Framework for Risk Categorization and Corresponding Considerations; Application of Quality Management System and Clinical Evaluation and Evidence for Software as a Medical Device.

FDA's traditional approach to moderate and higher risk hardware-based medical devices is not well suited for the faster iterative design, development, and type of validation used for software-based medical technologies. FDA recognized the need for a new approach for digital health oversight, and created a Digital Health Program that is helping advance this technology by establishing new relationships and fostering collaboration with digital health developers, patients, and providers. In addition, this program is tasked with developing and implementing regulatory strategies, policies, and processes in this area—and then providing transparency and clarity on those policies and processes. FDA recognizes that an efficient, risk-based approach to regulating digital health technology will foster innovation of digital health products.

Prof Paul FOSTER
Professor, Ophthalmic Epidemiology and Glaucoma Studies, UCL Institute of Ophthalmology
Honorary Consultant, Moorfields Eye Hospital
United Kingdom

Paul Foster is Professor of Ophthalmic Epidemiology and Glaucoma Studies at UCL Institute of Ophthalmology, and honorary consultant at Moorfields Eye Hospital. A graduate of Nottingham University Medical School, his residency training was at Oxford Eye Hospital, and Moorfields Eye Hospital. He has a PhD in epidemiology of glaucoma. His current research interests include the epidemiology, environmental determinants, surgical management and prevention of glaucoma. Major research projects include:

- PI: EPIC-Norfolk Eye Study: a cohort of 8,623 people aimed at investigating novel environmental and genetic factors in eye disease
- Consortium Lead- UKBiobank Eye and Vision Consortium (eye and vision data on 130,000 people)
- ZAP study: (China) A randomised, controlled trial of prophylactic laser iridotomy in 890 high risk individuals in China

Prof Foster has published 215 peer-reviewed papers, 15 book chapters and 5 journal editorials. He was elected a member of the Glaucoma Research Society, which is limited to 100 active members worldwide, promoting excellence in glaucoma research. He was also voted among the 100 most influential ophthalmologists worldwide in 2014 and 2016. He received awards recognising his contribution to ophthalmology in the UK, USA, Australia, New Zealand, Singapore and China.

NEW MODELS OF CARE FOR CHRONIC EYE DISEASE TO MEET GROWING DEMAND IN THE UK

Synopsis

Moorfields Eye Hospital is the largest eye care provider in the Western hemisphere, delivering over 750,000 patient care episodes per year across 23 sites in south-eastern England and in Dubai. Despite improving outcomes for patients over the last 2 decades, chronic eye care presents challenges because of greater patient longevity, greater intensity of treatment and declining NHS healthcare budget. Following the financial crisis of 2008, the UK healthcare sector has been called on to provide "efficiency savings" of UKP 22 billion by 2020 (30 billion USD). For Moorfields, this challenge comes in the context of clinical activity increasing at the rate of around 7-8% per year. Glaucoma poses the biggest problem within Moorfields, as clinical activity is greater, and care pathways more complex than any other speciality. Some consultants in the UK have been running "virtual" nurse or technician-led clinics for over 20 years (Simon Harding in Sheffield for instance). In mid 2014, after a 2 year "design and pilot" phase, Moorfields opened a new care pathway for glaucoma - virtual clinics. Technicians collect data from patients at low risk of progression, and these are reviewed and further management determined by consultant review at a remote location after the patient has left. This has been successful in additional additional capacity to glaucoma clinics. This has now been complemented by a third care pathway, optometrist led clinics. Hence, three patient care streams are now (a) surgical & complex (ophthalmologists); (b) intermediate (optometrists); (c) virtual/stable monitoring (technicians).

Dr Calvin HO
Assistant Professor
Centre for Biomedical Ethics
Yong Loo Lin School of Medicine, National University of Singapore (NUS)
Singapore

Calvin Wai-Loon Ho is Assistant Professor at the Centre for Biomedical Ethics at the Yong Loo Lin School of Medicine, National University of Singapore, Co-Head of the World Health Organization Collaborating Centre for Bioethics in Singapore, and Editor-in-Chief of the journal Asian Bioethics Review. He is qualified as Advocate & Solicitor of the Supreme Court of Singapore, is appointed as a member of the Singapore Nursing Board, as well as a member on the advisory committees on transplantation and on genetic testing of the Ministry of Health (Singapore). Calvin has published on global health law and ethics, research ethics and policy, health policy and governance, and is the co-editor of Bioethics in Singapore: An Ethical Microcosm (World Scientific, 2010), Genetic Privacy (Imperial College Press, 2013), the author of Juridification in Bioethics (Imperial College Press, 2016), and a co-author of the World Health Organization's Guidelines on Ethical Issues in Public Health Surveillance (2017).

MEDICINE IN A BORDERLESS WORLD: ETHICAL AND REGULATORY CONSIDERATIONS IN TELE-OPHTHALMOLOGY

Synopsis

Owing to multiple technological advances, telemedicine now offers the opportunity for more affordable and accessible healthcare. There is already evidence to show that telehealth using real-time video consultations could help to reduce inequalities that arise from the uneven provision of ocular health services in rural and remote areas. Where more routine clinical practice is concerned, the ethical and regulatory implications of teleophthalmology (such as the transmission of diabetic retinopathy images) and 'big data' analytics that could be applied for a variety of purposes have yet to be fully considered. This presentation discusses the essential characteristics of teleophthalmology and the key ethical and regulatory challenges that arise. With growing emphasis on patient-centred and holistic healthcare, the presentation further explains why it is important to match teleophthalmology with compatible clinical routines, and to identify opportunities to restructure certain aspects of clinical work.

Prof Jost B. JONAS
Comprehensive Ophthalmologist, Clinical Scientist & Chairman of Department
Department of Ophthalmology
Medical Faculty Mannheim, Ruprecht-Karls-University Heidelberg
Germany

Jost B. Jonas, MD is a comprehensive ophthalmologist and clinical scientist and is Chairman of the Department of Ophthalmology of the Medical Faculty Mannheim of the Ruprecht-Karls-University Heidelberg/Germany.

He became member of the German Academy of Science Leopoldina, the Glaucoma Society of the International Congress of Ophthalmology, and the Macula Society and Retina Society, and provisional member of the Academia Ophthalmologica Internationalis. He is Honorary Member of the French Ophthalmological Society and Asia-Pacific Vitreoretinal Society and Fellow of the Association of Research in Vision and Ophthalmology ARVO. He has received the Glaucoma Award of the German Ophthalmologic Society, the Junior and Senior Award of the American Academy of Ophthalmology, the Senior Clinical Scientist Award of the World Glaucoma Association, the Prof Robert-Ritch Glaucoma Award, the International Gold Awards of the Chinese Ophthalmologic Society, and the Senior Award of the Asian Pacific Academy of Ophthalmology.

He has research interests in the intravitreal application of medication as treatment of intraocular edematous, proliferative and neovascular diseases; the intravitreal cell-based (drug) therapy; the homologous intravitreal bone-marrow transplantation; the retinal microglial cell system; the contact lens associated ophthalmodynamometry for measurement of the retinal arterial and venous blood pressure and cerebrospinal fluid pressure; the morphologic diagnosis of optic nerve diseases including the glaucomas; the association between the cerebrospinal fluid pressure and ocular disorders; population-based studies (Beijing Eye Study 2001, 2006, 2011; Beijing Public Health Care Study; Beijing Pediatric Eye Study; Beijing Children Eye Study; Beijing High-School Students Study; Shandong Children Eye Study; Gobi Desert Children Eye Study; Asymptomatic Polyvascular Abnormalities in Community (APAC) Study; Kailuan Study; Ningxia High Myopia Study; Central India Eye and Medical Study; Central India Children Eye Study; Ufa Eye and Medical Study); and in the process of emmetropization and myopization.

THE BEIJING EYE PUBLIC HEALTH CARE STUDY: TELE-OPHTHALMOLOGY AND ITS APPLICATION

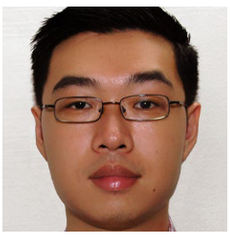
Synopsis

PURPOSE: The Beijing Eye Public Health Care Project was designed to screen all elderly subjects (age 55-85 years) of the rural region of Greater Beijing. It was developed as a preparatory step for a telemedicine-based public health care system in ophthalmology in China.

METHODS: The population-based public health care project included elderly subjects (age 55-85 years) of the rural region of Greater Beijing. Project participants were visited, interviewed, and examined by 2500 high school graduates trained as ophthalmic technicians. If visual acuity was <0.30, subjects were referred to primary health care centers where ocular photographs were taken. Using telemedicine, the photographs were transmitted to a reading center and causes for visual impairment were diagnosed.

RESULTS: Out of 692 323 eligible inhabitants, 562 788 (81.3%) subjects participated. Visual impairment in ≥1 eye was detected in 54 155 (9.62%) subjects, and among them, 30 164 (5.36%) subjects had bilateral visual impairment. Ocular fundus photographs were taken for 37 281 subjects. Cause for visual impairment was cataract in 19 163 (3.41%) of all screened subjects, glaucoma in 1606 (0.29%) subjects, diabetic retinopathy in 905 (0.16%) subjects, other macular diseases in 2700 (0.48%) subjects, pterygium in 1381 (0.25%) subjects, and corneal leukoma in 283 (0.05%) subjects. For 5853 (1.04%) subjects, a diagnosis of premature or mature cataract was made showing the urgent need of cataract surgery. After cataract surgery, visual acuity was ≥0.30 in 1464 (91.7%) of 1596 postoperatively reexamined subjects.

CONCLUSIONS: Using a telemedicine approach, the Beijing Eye Public Health Care Project developed, applied and tested an infrastructure for ophthalmic mass screening of >500 000 elderly inhabitants with a response rate of >80%. Beside cataract, retinal diseases including diabetic retinopathy and glaucoma were major causes for visual impairment.



Dr Gilbert LIM
Research Fellow
Department of Computer Science, School of Computing,
National University of Singapore
Singapore

Gilbert is currently a postdoctoral researcher working on applying computer vision and machine learning to medical imaging. His doctoral work was on quantifying and classifying various retinal diseases - such as diabetic retinopathy, age-related macular degeneration and glaucoma - from retinal fundus photographs.

CHALLENGES IN AUTOMATED RETINAL IMAGING

Synopsis

Artifical intelligence has long been applied to retinal imaging, both to relieve and enhance the performance of clinicians on this repetitive and often tedious task. Recently, the rise of deep learning has enabled human-level performances from fully-automated systems in this fast-moving field. However, it is easy to lose sight of A.I.'s limitations and blind spots, amidst all the excitement. As such, we review a number of extant challenges impeding the actual deployment of A.I. systems, and suggest some possible solutions.

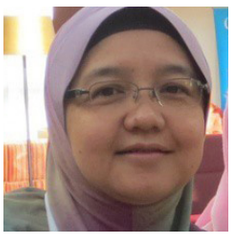
Dr LIU Yong
Senior Scientist
Institute of High Performance Computing, A*STAR
Singapore

Dr Liu Yong is a Scientist with the Institute of High Performance Computing, A*STAR. He received his PhD in Electrical and Computer Engineering from NUS in 2006. His research interest involves AI, machine learning, deep learning and reinforcement learning. He is the co-author of 'Stochastic Network Calculus' and the First Prize Winner of Rakuten TV Recommender Challenge 2015.

HOW AI WILL HELP TELE-OPHTHALMOLOGY

Synopsis

In this talk, our recent work on AI applications on tele-ophthalmolgy will be shared. In these applications, AI not only helps clinicians to see faster and better, but also can see more things beyond clinician eyes to provide more clinical value by connecting dots which may not be easily picked up by clinicians. Some challenges and potential future areas of AI-driven healthcare applications will also be discussed.



Dr Nor Fariza NGAH
National Head of Ophthalmology Services
Ministry of Health
Malaysia

Dr Nor Fariza Ngah is the National Head of Ophthalmology Services at the Ministry of Health, Malaysia and Head of Ophthalmology in Shah Alam Hospital. She completed her studies in University Malaya and University Kebangsaan Malaysia, followed by a fellowship in Medical Retina and Uveitis in UK. She is responsible for setting up the first medical retina and Uveitis Unit as the tertiary center for MOH in Hospital Selayang. She had established the unit with complete imaging laboratory and specific treatment facilities. She is the Chairperson for Training for Diabetic Retinopathy training program in MOH and responsible to establish the Diabetic Retinopathy Screening Module- currently used as per National reference, and for the National Clinical Practice Guidelines (CPG) for the Diabetic retinopathy Screening (DRS).

DISRUPTIVE METHODOLOGIES IN PREVENTING BLINDNESS IN MALAYSIA

Synopsis

The National health and morbidity surveys (NHMS) in 2015, highlighted that Malaysia is the number one country in Southeast Asia with the highest number of diabetics (17.5%-3.5million citizen with diabetes mellitus). The National Eye Survey II, 2014, revealed that Diabetic retinopathy is second cause of blindness (10%) after cataract (58%).

There are many strategies have been done to ensure all diabetic patients has their eye assessment. The Diabetic retinopathy screening program, diabetic retinopathy screening modules and Clinical practice guideline are well established in Malaysia, however the mechanism to report the findings for appropriate referral and early treatment is still a challenge. They are many methods of reporting as using the trained paramedical staff, optometrist, family medicine specialist as well Ophthalmologist either manually or via telemedicine technology.

The latest strategy is to have our very own DR reading centre to help with the reporting and to ensure patient is getting the appropriate referral.

Dr Tyler Hyungtaek RIM
Department of Ophthalmology, Severance Hospital,
Yonsei University College of Medicine, Seoul
Korea

Tyler Hyungtaek Rim, MD, MBA is a vitreoretinal surgeon and is currently working as Assistant Professor at the department of ophthalmology in Yonsei University Health System, Seoul, Korea. His field of interest includes statistics and machine learning. He also co-founded medical A.I. startup, "Medi-whale" in 2016.

RETINAL DAMAGE AS THE WINDOW TO CARDIOVASCULAR ORGAN DAMAGE: USE OF BIG DATA AND MACHINE LEARNING

Synopsis

To determine if deep learning networks could be trained to estimate coronary artery calcium score (CACS) in heart CT scan from retinal image of retinal images or optical coherence tomography images. Deep-learning based screening of fundus photographs and OCT may have potential for a surrogate marker without radiation exposure for high-risk patients with high coronary artery calcium score.

A/Prof Paisan RUAMVIBOONSUK
Scientific Secretary
Asia-Pacific Vitreo-Retina Society (APVRS)
Thailand

Dr Paisan Ruamviboonsuk is the Scientific Secretary of Asia-Pacific Vitreo-Retina Society (APVRS), a council member of Asia-Pacific Academy of Ophthalmology (APAO), and a Secretary General of Association of Southeast Asian Nations (ASEAN) Ophthalmology Society. He was the Immediate Past President of the Royal College of Ophthalmologists of Thailand and the Past President of the Thai Retina Society.

He is one of the renowned retinal specialists in Asia-Pacific region and received many international awards including APAO Arthur Lim Award, APAO Achievement Award, APAO Distinguished Service Award, and United Nations Public Service Award.

REAL-WORLD APPLYING AI AND TELE-OPHTHALMOLOGY: LESSONS LEARNT FROM THAILAND

Synopsis

Ministry of Public Health of Thailand has adopted screening for diabetic retinopathy as one of indicators for eye care service in Thailand. The screening is conducted in each of the 78 provinces of Thailand with more than 600 fundus cameras used throughout the country for more than 5 years and more than a million patients with diabetes are screened per year. However, the screening rate for the whole country is still lower than 60%, the goal set by the government. How can teleophthalmology be implemented effectively to play a significant role to improve the screening?

Dr Muhammad Bayu SASONGKO
Associate Professor
Department of Ophthalmology, Faculty of Medicine Public Health and Nursing
Universitas Gadjah Mada - Dr Sardjito General Hospital
Yogyakarta, Indonesia

Dr Muhammad Bayu Sasongko is an Associate Professor in Ophthalmology with Faculty of Medicine Public Health and Nursing at Gadjah Mada University, Indonesia. His research interest is in epidemiology studies and developing a screening programme to reach populations in rural Indonesia.

DEVELOPMENT OF RAPID ASSESSMENT OF DIABETIC RETINOPATHY (RADR) SYSTEM FOR RURAL AREAS IN INDONESIA

Synopsis

Recent evidence has suggested that the burden of diabetic retinopathy (DR) and diabetes-related blindness in Indonesia is considered very high. Overall, around 1 every 4 adults with type 2 diabetes had vision-threatening DR, which even higher in rural areas. This number will continue to grow in the future following two things: 1) the fact that only less than 10% of persons with diabetes have had eye screening and 2) the increase of diabetic population in the country. Therefore, public health program that facilitates DR screening is needed to avoid the significant growth of DR associated blindness in Indonesia.

To date, community-based DR screening program has been piloted in three major areas of Indonesia, Jakarta, Bandung and Jogjakarta with different approaches applied in each area. There were some challenges identified, particularly related to the delivery of DR screening service in rural or remote areas. In response to this, we have developed a tele-system that may facilitate automated grading for referable DR for rural communities. Nonetheless, insufficient data transmission capacity remains s significant constrain that limit the applicability of our new system, thus demands further innovation. In this session, progress towards the development of new system for DR screening in Indonesia will be discussed.

Prof Leopold SCHMETTERER
Scientific Director & Head of Ocular Imaging
Singapore Eye Research Institute (SERI)
Singapore

Professor Leopold Schmetterer is the Scientific Director & Head of Ocular Imaging for the Singapore Eye Research Institute. He graduated from the Technical University of Vienna. He finished his PhD in 1989. He is Head of Ocular Imaging and Scientific Director at Singapore Eye Research Institute, and Professor of Ophthalmology at the Nanyang Technological University. Until Aug 2016, he was chairing the Ophthalmic Pharmacology at the Department of Clinical Pharmacology at the Medical University of Vienna. In addition, he had an affiliation with the Center of Medical Physics and Biomedical Engineering. Dr Schmetterer held a post doc position at the Institute de Recherche en Ophthalmologie in Sion and was a guest Professor at EPFL in Lausanne.

His research interests include a wide array of sub-specialties in ophthalmology including imaging, glaucoma, medical retina and dry eye syndrome. He is involved in many international societies including EVER (president 2012 and president elect of the EVER foundation), ARVO (program committee member 2009-2011), ISOPT (program committee member), AOPT and Association of Ocular Circulation (AOC, president).

Dr Schmetterer is a member of many Editorial Boards including Progress of Retinal and Eye Research, Acta Ophthalmologica, Current Eye Research, Journal of Ocular Pharmacology and Therapeutics and Ophthalmic Research. He has published more than 310 articles in peer-reviewed journals, more than 50 book chapters and recently edited a book on "Ocular Blood Flow".

AI IN GLAUCOMA: WHICH QUESTIONS SHOULD WE ASK?

Synopsis

The diagnosis of glaucoma is complex and involves a variety of tests including visual field testing, OCT imaging measurement of intraocular pressure and slitlamp biomicroscopy. A wide variety of studies have shown that OCT imaging alone is not sufficient for diagnosing glaucoma. Using deep learning the sensitivity and specificity may increase.

Dr Dawn SIM
Consultant
Moorfields Eye Hospital
United Kingdom

Dawn is a consultant ophthalmic surgeon specialising in Cataract and Retina at Moorfields Eye Hospital. A former chief resident at Moorfields and the current clinical lead for Moorfields South at Croydon and Diabetic Retinopathy Screening there.

Dawn's current research interests include new technology in retinal imaging and the field of teleophthalmology. She is working with device-agnostic platforms to facilitate acceleration of new technology and artificial intelligence software into clinical practice.

For two consecutive years (2017 to 2018) she has been voted on the Ophthalmologist power-list as one of the top 100 ophthalmologists globally. Her previous awards include the ARVO Alcon Early Career Research Award winner, and Dawn is also a patent holder for the use of Indocyanine Green Dye for visualization of inflammation in the eye. A prolific and successful grant-raiser, Dawn also won the Dermot Pierse Royal Society prize in 2009 and the Young Investigator's Award at Asia ARVO in 2007.

THE UTILITY OF TELE-OPHTHALMOLOGY PRINCIPLES IN AN EYE HOSPITAL

Synopsis

A device-agnoist, cloud-based platform for teleophthalmology services was deployed in 3 community optometry practices, in an attempt to improve collaborative care with hospital eye services.

The pathway consisted of an artificial intelligence enabled, contextual, clinical history webapp that enables technician staff or optometrist to obtain specialist-level information from patients, cloud-based image transfer, and asynchronous specialist opinion within 48 hours. 80 eyes of 40 patients were included. 24 patients (60%) did not require a referral to the eye clinic, 32.5% required referral within 18 weeks, and 7.5% within 4 weeks. The most common diagnosis of patients who did not require a referral was dry age-related macular degeneration (AMD) (12/24, 50%) Of those referred, the most common were: suspicion of wet AMD and glaucoma.

The majority of virtual referrals (60%) in this study did not require a referral to hospital, which enabled the remaining 40% who required specialist care or treatment to be seen in a timely fashion. The use of advancing technology and teleophthalmology principles in the face of diminishing resources in the public health sector allows collaborative care approaches that will likely be crucial to ensure that the right patient is seen in the right place at the right time.

Dr Karthik SRINIVASAN
Medical Officer
Aravind Eye Hospital in Madurai
India

Dr Karthik is a medical officer at Aravind Eye Hospital in Madurai, India. He is the Principal Researcher for many DR patient engagement projects and also the Program Director for Healthy Eyes and QoL in premature infants. He is also the recipient of the Zonal Newton Award 2017.

TELE-OPHTHALMOLOGY INITIATIVES IN INDIA - ARAVINDS' EXPERIENCE

Synopsis

The talk will focus on initiatives from Aravind to combat needless blindness including the use of tele ophthalmology for screening camps, for Diabetic Retinopathy screening, for Retinopathy of prematurity and in the field of primary eye care provision.It will also address the ability to address human resource challenges in a developing country like India with emphasis on using paramedical staff to do the ground work and research on using automatic grading or diagnosis with the help of Artificial intelligence and deep learning.

A/Prof Colin TAN
Associate Professor of Ophthalmology, Duke-NUS Medical School
Assistant Professor, Lee Kong Chian School of Medicine
Senior Consultant Ophthalmologist, National Healthcare Group Eye Institute, Tan Tock Seng Hospital.
Singapore

A/Prof Colin Tan is an Associate Professor of Ophthalmology, Duke-NUS Medical School; Assistant Professor, Lee Kong Chian School of Medicine and Senior Consultant ophthalmologist from the National Healthcare Group Eye Institute, Tan Tock Seng Hospital. He completed a Fellowship in Medical Retina and Retinal Imaging at the Doheny Eye Institute, University of Southern California, Los Angeles, USA.

He is the Head of the Fundus Image Reading Center, Head of Research and Deputy Head of Vitreoretina at the National Healthcare Group Eye Institute. A/Prof Tan manages patients with retinal conditions such as polypoidal choroidal vasculopathy, age related macular degeneration, diabetic retinopathy and other retinal vascular diseases.

A/Prof Tan has received the National Medical Research Council Transition Award (TA), as well as the National Healthcare Group Clinician Scientist Career Scheme (CSCS) and Clinician Leadership in Research (CLR) awards. In addition, he has received numerous academic and scientific awards such as the Clinician Investigator Award, American Academy of Ophthalmology Achievement Award, and American Society of Retinal Specialists Senior Honor Award. He has over 170 publications in international journals and has presented his research at various international conferences. His research interests include vitreoretinal conditions such as polypoidal choroidal vasculopathy, age-related macular degeneration and diabetic retinopathy; myopia and its complications; cataract surgery, epidemiology, and retinal imaging techniques, including optical coherence tomography angiography (OCTA).

In addition to an active clinical practice and research, A/Prof Tan also has a keen interest in education. He has received education awards such as the Dean's Award for Excellence in Teaching from the Yong Loo Lin School of Medicine and Top Ten Teachers Award from Tan Tock Seng Hospital.

TELE-OPHTHALMOLOGY – OUR EXPERIENCE AT THE NATIONAL HEALTHCARE GROUP EYE INSTITUTE

Synopsis

In a world with rapid advances in technology, tele-medicine has assumed an increasingly larger role in providing healthcare to remote populations. Ophthalmology is suited for remote screening and review due to the image-intensive nature of eye diseases. The National Heatlhcare Group Eye Institute initiated a tele-ophthalmology program since 2009. This has the benefits of right siting of care, and reduction of unnecessary referrals to tertiary clinics, as well as improved patient experience.

Dr Gavin TAN
Consultant, Vitreo-Retinal Department
Singapore National Eye Centre
Singapore

Dr Gavin Tan is a Consultant in the Vitreo-Retinal Department of the Singapore National Eye Centre and a Visiting Consultant for the Vitreo-Retinal service at Changi General Hospital. He is a specialist in General Ophthalmology and Cataract Surgery, and a subspecialist in Vitreo-Retinal surgery. He is also the Clinical Director of SNEC Ocular Reading Centre. Dr Tan is actively involved in academic research, and is the Principal Investigator of multiple clinical trials in Singapore Eye Research Institute, and has published scientific papers in respected peer-reviewed journals and has presented at numerous international scientific meetings.

DEVELOPING A COMPREHENSIVE TELE-SCREENING PROGRAM FOR DIABETIC RETINOPATHY: THE SIDRP EXPERIENCE

Synopsis

There is good evidence telemedicine screening can provide cost effective screening for diabetic retinopathy with a significant reduction in the rates of diabetic blindness. Evidence and protocol for screening of diabetic patient will be discussed in the context of the development of a national telescreening program for diabetic patients in Singapore utilising a custom built comprehensive cloud based platform.

Dr Tengku Ain Fathlun Binti TENGKU KAMALDEN
Clinician-Scientist and Vitreoretinal Surgeon
Department of Ophthalmology
University of Malaya, Kuala Lumpur
Malaysia

Tengku Ain Kamalden, MBBS DPhil, is a clinician-scientist and vitreoretinal surgeon at the Department of Ophthalmology, University of Malaya, Kuala Lumpur Malaysia. She was awarded DPhil in 2013 for her work on retinal neuroprotection from Green Templeton College, University of Oxford under the supervision of Professor Neville Osborne. She then completed medical and surgical retinal fellowship at the National University Hospital, Singapore (NUHS). She was selected to be among 20 young clinicians from around the world for the InterAcademy Medical Panel (IAMP) Young Physician Leader programme during the World Health Summit in Berlin, 2013. More recently, she has been nominated for the Fulbright Research Scholar Program for the 2018/19 academic year.

Dr Kamalden is holding the position as Associate Professor at the University Malaya Medical Centre, which is the oldest teaching hospital in Malaysia. She is the present head of the University of Malaya Eye Research Centre and has established several successful international collaborations with University of Liverpool and Johns Hopkins School of Medicine. She holds an honorary senior lecturer position at the University of Liverpool under the UM-UoL dual PhD programme. She is currently pursuing an MSc in Epidemiology at the London School of Hygiene and Tropical Medicine to compliment her laboratory-based research work. Her research interests include diabetic retinopathy, retinopathy of prematurity and ocular trauma. Currently she is actively researching on microRNA as biomarkers in diabetic retinopathy in a Malaysian population.

RETINAL VASCULAR IMAGE ANALYSIS IN ASSESSMENT OF VASCULAR HEALTH IN CHILDHOOD CANCER SURVIVORS

Synopsis

Childhood cancer survivors (CCS) are reported to have premature onset of cardiovascular diseases such as ischemic heart diseases in their early adulthood compared to their counterparts who usually manifest these conditions much later in their adult lives. This premature ageing phenomenon contributes to the long-term morbidity and mortality of CCS. Microvascular health changes can be assessed by several methods, including arterial tonometry, retinal vessel analysis and specific circulating biomarkers involved in the pathogenesis of cardiovasculopathy. This pilot project analyses the use of retinal vessel analysis in detecting small microvascular changes among CCS. Taken together with other factors, retinal vascular analysis can be potentially developed further as part of a risk predictive algorithm using artificial intelligence in the future to detect high risk individuals among CCS.

Dr Daniel TING
Assistant Professor
Singapore National Eye Center and Duke-NUS Medical School
Singapore

Dr Daniel Ting is currently an Associate Consultant in Singapore National Eye Center and an Assistant Professor at Duke-NUS Medical School Singapore. He became the first Ophthalmologist in Singapore to be awarded the highly prestigious US J. William US-ASEAN Fulbright Scholar Award, representing Singapore to visit Johns Hopkins University (JHU) School of Medicine and Applied Physics Laboratory to deepen his understanding on the use of artificial intelligence (AI), big data analytics and telemedicine in the field of Ophthalmology. Upon return, he has also become the Fulbright alumni who continues to participate in the US Embassy Mentoring Program and the member of Singapore Fulbright Association.

Research wise, he completed his PhD in 2015 with the University of Western Australia, in the field of health technology for diabetes eye diseases. With the evolution of technology and AI, he recently patented (with 4 co-inventors) and published another breakthrough AI technology using deep learning technique in screening for diabetes eye diseases. This article was published in one of the highest impact medical journal - JAMA in Dec 2017, entitled 'Deep Learning System in Diabetes and related Eye Diseases in Multi-ethnic Population with Diabetes'. Apart from AI, big data analytics and diabetes, he has also published and currently involved in numerous retina clinical and imaging researches on retinal detachment, age-related macular degeneration. He serves as a reviewer in many high impact journals, including Nature Medicine, Diabetes Medicine, Diabetes Care, Hypertension, Ophthalmology, American Journal of Ophthalmology, JAMA Ophthalmology, Investigative Ophthalmology and Visual Sciences and Retina. He is also an external grant reviewer for the AI grant in Ophthalmology.

AI FOR OPHTHALMOLOGY: WHERE ARE WE NOW? WHAT'S NEXT?

Synopsis

Artificial intelligence (AI) using deep learning system (DLS) had sparked tremendous interest globally over the last 2 years. Many groups have published the use of DLS and fundus images in Ophthalmology. This talk focuses on the current state-of-art DLS technologies and the future directions of AI application in Ophthalmology.

Dr Harvey Siy UY
Peregrine Eye & Laser Institute
Philippines

Dr. Harvey Uy earned his Bachelor's Degree as Magna Cum Laude in Biology at the University of the Philippines in 1986. In that same year, he received the UP Presidential Pin and entered the prestigious Phi Kappa Phi Honor Society. He received his medical degree from the UP College of Medicine in 1991 in Manila. One of Dr. Harvey Uy's recent achievements is winning the Best Paper of the Session Award at the 2012 American Academy of Ophthalmology Annual Meeting in Chicago for a paper on "Image Guided Cataract Surgery" which introduced a new concept of using high resolution imaging systems to visualize cataracts and help surgeons perform a better, safer operation. It was selected as best paper by a panel of international cataract experts.

ENHANCING PRACTICE EFFICIENCY

Synopsis

The vast majority of eye care practices are small to medium in size. This presentation will chronicle a medium-sized, multi-site, eye center's digital journey from printed charts to digital connectivity. The material will highlight the challenges, opportunities and rewards of becoming a fully connected practice.

Mr Koen VAN DE PERRE
Director
International Eye Care & Offering Management
IBM Watson Health
Belgium

Koen Van De Perre is the Director of International Eye Care & Offering Management for IBM Watson Health. In this role he contributes to the development of the Watson Health solutions through interactions with Key Opinion Leaders, bringing the market needs and trends back to the development team.

With a background in ophthalmic nursing and a post graduate degree in marketing from the University of Antwerp, Koen has an extensive background and passion for healthcare. He brings 23 years of experience focused on the ophthalmology practice. Aside from his passion for healthcare, Koen has a passion for music, art, cooking and vintage cars.

ENTERPRISE IMAGING AND ARTIFICIAL INTELLIGENCE IN OPHTHALMOLOGY

Synopsis

Ophthalmic providers face immense challenges, including an aging population, physician shortage and data silos. These challenges present opportunities for eye care professionals. With the right enterprise imaging strategy, providers can drive sustainability, control costs and provide quality patient care. Join this discussion to learn about the ophthalmic market challenges, how providers can chart a path forward and how artificial intelligence comes into play.

Prof WONG Tien Yin
Medical Director, Singapore National Eye Centre (SNEC)
Vice-Dean (Academic and Clinical Development), Duke-NUS Medical School
Deputy Group CEO (Research and Education), SingHealth
Singapore

Prof Wong completed medical school at the National University of Singapore (NUS), residency training in ophthalmology at the Singapore National Eye Centre (SNEC), and medical retinal fellowships at the University of Wisconsin, Madison, USA and University of Sydney, Australia. He has a MPH and PhD from the Johns Hopkins University, USA. As Chair of Ophthalmology and Medical Director of SNEC, Prof Wong helms one of the largest tertiary eye hospital in Asia, with a faculty of >70 ophthalmologists managing >350,000 outpatient visits and >30,000 surgeries and procedures annually. SNEC's research division, the Singapore Eye Research Institute (SERI), is one of the world's leading eye research institutes. Prior to his current appointment as its Chairman, Prof Wong was Executive Director of SERI and Chairman of the Department of Ophthalmology, National University of Singapore. Prof Wong was previously Professor and Head of the Department of Ophthalmology, the University of Melbourne and Managing Director of the Centre for Eye Research Australia (CERA), Australia.

Prof Wong is a retinal specialist with a clinical practice focusing on major retinal diseases including diabetic retinopathy, age-related macular degeneration and myopic macular degeneration. He has a broad-based research program comprising epidemiological, clinical and translational studies of these retinal diseases, and the use of retinal imaging to predict disease risk. His particularly focus is on diabetic retinopathy, and he has led and conducted studies covering prevalence, risk factors, imaging markers, clinical treatment and screening for diabetic retinopathy. He has published >1,000 peer-reviewed papers, including papers in the New England Journal of Medicine and the Lancet, and given >300 invited plenary, symposium and named lectures globally. He has received >US$50 million in grant funding as Principal Investigator. Prof Wong has been recognized nationally and internationally with numerous awards, such as the Alcon Research Institute Award, the Novartis Prize in Diabetes, the Australian Commonwealth Health Minister's Award, the Arnall Patz Medal from the Macula Society and the Tano Lecture from the Asia Pacific Vitreo-Retinal Society. He received the President's Science Award in 2010, and the President's Science and Technology Award in 2014, the highest awards for scientific contribution in Singapore.

EMERGENCE OF ANTI-VEGF TREATMENT OVER THE LAST DECADE

Synopsis

Neovascular (nAMD) is the leading cause of severe vision loss and legal blindness in people over the age of 65 in North America, Europe, Australia and Asia, impacting an estimated 20 to 25 million people worldwide. nAMD occurs when abnormal blood vessels form underneath the macula, the area of the retina responsible for sharp, central vision. These blood vessels are fragile and leak fluid, disrupting the normal retinal architecture and ultimately causing damage. Without treatment, vision can rapidly deteriorate.

This talk will explore the evolution of treatment options for nAMD and how these treatments have impacted the outcomes for nAMD patients. Changes in treatment regimens and a newer anti-VEGF agent will also be highlighted during this talk.

Dr Sangchul YOON, MD.Ph.D
Director of Global Health and Innovations, National Medical Center
Adjunct Professor, Department of Ophthalmology, College of Medicine
Yonsei University
South Korea

Dr Sangchul Yoon, MD, PhD is the Director of Global Health and Innovations, National Medical Center, South Korea and Adjunct Professor Dept of Ophthalmology, College of Medicine, Yonsei University, South Korea. He is a board certified ophthalmologist who had received specialty training in cornea and a doctorate degree in Public Health. His specific research interests lie on the betterment of the health status of people in the low and middle-income countries while improving their health accessibility through innovative approaches such as mHealth. He has an expertise for implementation of health projects connecting the clean bench to the actual field output while generating firm and sound evidence our of them through Project BOM affiliated with Yonsei University Severance Hospital, which is a research organization he had founded in 2012. With years of experience and knowledge from the health sector in LMICs, he is now is a member of the technical advisory committee for global health for Korea International Cooperation Agency (KOICA), which is a governmental organization responsible for South Korea's Official Developmental Assistance (ODA).

CONTINUUM OF CARE IN EYE HEALTH THROUGH TELE-OPHTHALMOLOGY

Synopsis

Eye care services should be embedded in the primary health care system at the community level in order to ensure them to be sustainable, affordable, equitable, and comprehensive in order to achieve the Universal Eye Health. To attain the continuum of care for eye diseases, it is important to establish the capacity of the key informants, which refer to already existing health care human resources in the community including the Village Health Workers.

The rapid proliferation of teleophthalmology has plenty of benefits on this matter because it may extend the coverage of proper eye health services to the areas where there are barriers to deliver them through empowering the key informants' capacity to provide eye health services. From numerous cases of pilot studies, teleophthalmology has demonstrated results beyond expectation in the conventional approach of public eye health, which yielded quite optimistic forecast of the field.

However, there are scarce number of cases regarding the large-scale implementations of teleophthalmology at the moment. Moreover, teleophthalmology is no exception for the drawbacks of the pilot studies so called 'pilotitis.' Therefore, this presentation will be discussing about the introduction of sharing, monitoring and evaluation tools used for digital health interventions or mobile health to the teleophthalmology to provide guidance for better direction.

AI WORKSHOP

In recent years, artificial neural networks (a.k.a. deep learning) have significantly improved the fields of computer vision, speech recognition, and natural language processing. In this workshop, we will focus on solving image classification problems using deep learning technology in an easy way.

We will share some background knowledge of deep learning technology and introduce the workflow of a typical deep learning project, including:

- Data preparation
- Network selection and setup
- Model training
- Model deployment
- Visual interpretability

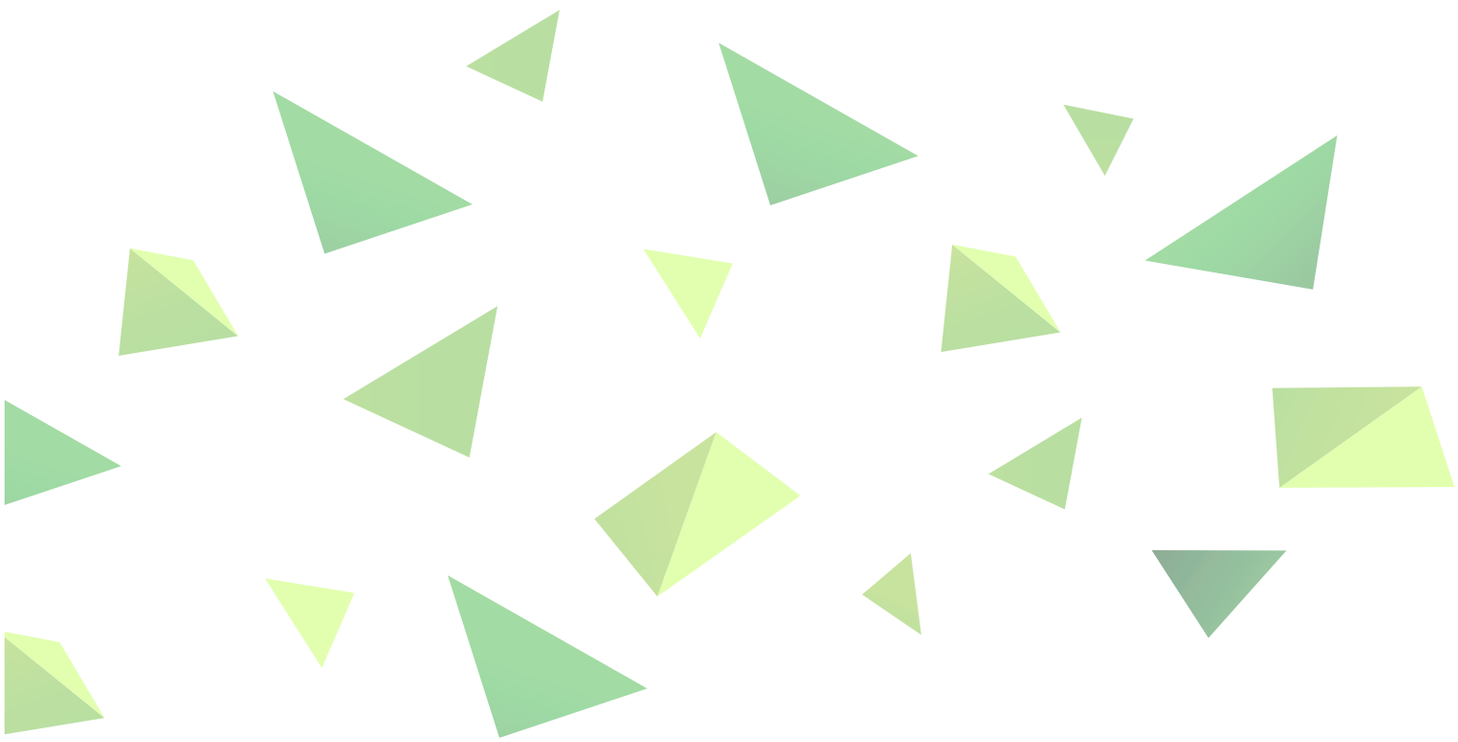
In this workshop, we will use Healgoo ML as the Machine Learning as a Service (MLaaS) platform for all hands-on demonstrations. Other cloud MLaaS services will also be briefly covered.

Healgoo ML is a web service that enables researchers and data scientists to build and bring superior machine learning models to production. It allows users to build up their own AI algorithms without having to worry about the technical details.

No computer coding skills are needed during the workshop. Just bring your laptop and data and start your exploration of artificial intelligence with us!

Details of the AI Workshop are as follows:

Date: Sunday, 8 July 2018
Time: 1430 – 1600 hrs
Venue: Seminar Room L1-S1, Level 1, The Academia, Singapore
Max Capacity: 40 pax



PROGRAMME OVERVIEW

	6 July, 2018 (Fri)	7 July, 2018 (Sat)			8 July, 2018 (Sun)	
0700		**Registration** (Foyer, Level 1)			**Registration** (Foyer, Level 1)	
0730						
0745						
0800			**SINGAPORE TELE-OPHTHAL-MOLOGY TOUR** (Primary Eye Care Centre & SNEC Ocular Reading Centre)	**APTOS COUNCIL MEETING & AGM** (L1-S1)	**Breakfast Symposium** (Sponsored by Carl Zeiss)	
0815						
0830						
0845						
0900					**APTOS Symposium 3: Artificial Intelligence and Big Data Analytics**	
0915						
0930						
0945						
1000		**Opening Ceremony & Welcome Address**				
1015						
1030					**Tea Break & Trade Exhibition**	
1045		**Scientific Keynote Symposium 1: Artificial Intelligence in Tele-Ophthalmology**				
1100					**APTOS Symposium 4: Global Tele-Ophthalmology Initiatives**	
1115						
1130						
1145						
1200		**Lunch Symposium** (Sponsored by Novartis)				
1215						
1230						
1245						
1300					**Handover of Flag**	
1315		**Dr Richard Fan Lectureship**				
1330					**Lunch Symposium** (Sponsored by Topcon)	
1345						
1400	**Pre-Registration** (Foyer, Level 1)	**Scientific Keynote Symposium 2: Artificial Intelligence & Big Data Analytics in Tele-Medicine**				
1415						
1430						
1445					**Free Paper Session I**	**AI Workshop** (L1-S1)
1500		**Tea Break & Trade Exhibition** (Sponsored by Medi-whale)				
1515						
1530						
1545		**APTOS Symposium 1: Regulatory in Artificial Intelligence**				
1600						
1615					**Tea Break & Trade Exhibition**	
1630						
1645		**APTOS Symposium 2: Mobile Devices in Tele-Ophthalmology**				
1700					**Free Paper Session II**	
1715						
1730		**Roundtable Discussions**				
1745						
1800					**Closing Remarks**	
1815		**Welcome Reception** (Singapore National Eye Centre, Lobby, Level 1)				
1830						
1845						
1900						
1915						
1930						

3RD ASIA PACIFIC TELE-OPHTHALMOLOGY SYMPOSIUM 2018
REGISTRATION: FRIDAY, 6 JULY 2018

1400 – 1800	**REGISTRATION**	**ACADEMIA FOYER, LEVEL 1**

DAY 1: SATURDAY, 7 JULY 2018

0700 – 1000	**REGISTRATION**	**ACADEMIA FOYER, LEVEL 1**
0800 – 1000	**SINGAPORE TELE-OPHTHALMOLOGY TOUR** ((Primary Eye Care Centre & SNEC Ocular Reading Centre)	**APTOS COUNCIL MEETING & ANNUAL GENERAL MEETING** (Seminar Room L1-S1, Level 1)
1000 – 1030	**OPENING CEREMONY & WELCOME SPEECH**	**AUDITORIUM, LEVEL 1**
1000 – 1010	Singapore National Eye Centre Video Presentation	
1010 – 1015	Welcome Address by Congress President, 3rd APTOS 2018	Dr Gavin TAN
1015 – 1020	Welcome Address by Medical Director, Singapore National Eye Centre	Prof WONG Tien Yin
1020 – 1025	Welcome Address by Council President, APTOS	Prof HE Mingguang
1025 – 1030	Welcome Address by Scientific Director, 3rd APTOS 2018	Dr Robert CHANG
1030 – 1155	**SCIENTIFIC KEYNOTE SYMPOSIUM 1: ARTIFICIAL INTELLIGENCE IN TELE-OPHTHALMOLOGY**	**AUDITORIUM, LEVEL 1**
Moderator	**Prof WONG Tien Yin, Dr Philippe BURLINA**	
1030 – 1048	Tele-Ophthalmology and Artificial Intelligence	A/Prof Lama AL-ASWAD
1048– 1106	Recent Developments in Deep Learning and Applications to Healthcare and Retinal Imaging	Dr Philippe BURLINA
1106 – 1124	Deep Learning System for Retinal Imaging	Dr Lily PENG
1124 – 1142	Fundus Screening and Diagnosis with AI in China	Prof WANG Ningli
1142 – 1155	Panel Discussion	
1155 – 1240	**LUNCH SYMPOSIUM** ***(SPONSORED BY NOVARTIS)***	**AUDITORIUM, LEVEL 1**
Moderator	**A/Prof Ian YEO**	
1155 – 1240	Emergence of Anti-VEGF Treatment Over the Last Decade	Prof WONG Tien Yin
1240 – 1315	**Lunch / Trade Exhibition**	**AUDITORIUM FOYER, LEVEL 1**
1315 – 1355	**DR RICHARD FAN LECTURESHIP 2018**	**AUDITORIUM, LEVEL 1**
Citation	**Dr Gavin TAN**	
1315 – 1345	Artificial Intelligence in Real World Screening	Prof HE Mingguang
1345 – 1355	Dr Richard Fan Lectureship Award Presentation	
1355 – 1500	**SCIENTIFIC KEYNOTE SYMPOSIUM 2:** **ARTIFICIAL INTELLIGENCE & BIG DATA ANALYTICS IN TELE-MEDICINE**	**AUDITORIUM, LEVEL 1**
Moderator	**Prof HE Mingguang, Prof Michael CHIANG**	
1355 – 1413	Clinical Applications and Concepts of Clinical Prediction Model Design	Dr Gil BINENBAUM
1413 – 1431	Tele-Medicine and Artificial Intelligence for Retinopathy of Prematurity: Evolution in the Standard of Care	Prof Michael CHIANG
1431 – 1449	A Clinical AI System for Identifying Newborn Infants at Risk of Vision Loss	Dr Jochen KUMM
1449 – 1500	Panel Discussion	
1500 – 1540	**Coffee & Tea Break / Trade Exhibition** ***(SPONSORED BY MEDI-WHALE)***	**AUDITORIUM FOYER, LEVEL 1**
1540 – 1630	**APTOS SYMPOSIUM 1: REGULATORY IN ARTIFICIAL INTELLIGENCE**	**AUDITORIUM, LEVEL 1**
Moderator	**Dr Robert CHANG, Dr Malvina B EYDELMAN**	
1540 – 1552	Regulation to Foster Worldwide Digital Health Innovation (FDA)	Dr Malvina B EYDELMAN
1552 – 1604	Medicine in a Borderless World: Ethical and Regulatory Considerations in Tele-Ophthalmology	Dr Calvin HO
1604 – 1616	Continuum of Care in Eye Health through Tele-Ophthalmology	Dr Sangchul YOON
1618 – 1630	Panel Discussion	
1630 – 1720	**APTOS SYMPOSIUM 2: MOBILE DEVICES AND OTHER USES IN TELE-OPHTHALMOLOGY**	**AUDITORIUM, LEVEL 1**
Moderator	**Dr Carol CHEUNG, Dr Daniel TING**	
1630 – 1642	The Potential of Retinal Imaging to Screen for Alzheimer's Disease	Dr Carol CHEUNG
1642 – 1654	Retinal Damage as the Window to Cardiovascular Organ Damage: Use of Big Data and Machine Learning	Dr Tyler Hyungtaek RIM
1654 – 1706	plano - Use of Mobile Devices in Eye Care	Dr Mohamed DIRANI
1706 – 1720	Panel Discussion	
1720 – 1805	**ROUNDTABLE DISCUSSION**	**AUDITORIUM, LEVEL 1**
1810 – 1915	**WELCOME RECEPTION**	**SNEC LOBBY, LEVEL 1**
1915	**End of Day 1**	

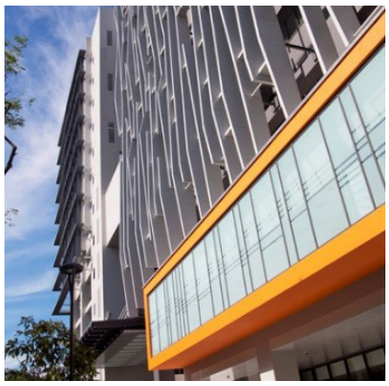
3RD ASIA PACIFIC TELE-OPHTHALMOLOGY SYMPOSIUM 2018
DAY 2: SUNDAY, 8 JULY 2018

0700 – 0745	**REGISTRATION**		**ACADEMIA FOYER, LEVEL 1**
0745 – 0815	**BREAKFAST**		**AUDITORIUM FOYER, LEVEL 1**
0815 – 0900	**BREAKFAST SYMPOSIUM: DIGITALISATION @ ZEISS** ***(SPONSORED BY CARL ZEISS)***		**AUDITORIUM, LEVEL 1**
	VISUHEALTH – An Evolving Ecosystem for Diabetic Retinopathy Screening Using VISUSCOUT 100 – A Handheld Non-Mydriatic Digital Fundus Camera Over a Cloud-Based AI Enabled Platform		Dr T C Ganesh BABU
	Enhancing Practice Efficiency		Dr Harvey Siy UY
0900 – 1030	**APTOS SYMPOSIUM 3: ARTIFICIAL INTELLIGENCE AND BIG DATA ANALYTICS**		**AUDITORIUM, LEVEL 1**
Moderator	**Prof Ryo KAWASAKI, Prof Leopold SCHMETTERER**		
0900 – 0912	What is Blockchain Technology?		Dr Robert CHANG
0912 – 0924	Enterprise Imaging and Artificial Intelligence in Ophthalmology		Mr Koen VAN DE PERRE
0924 – 0936	AI for Ophthalmology: Where Are We Now? What's Next?		Dr Daniel TING
0936 – 0948	AI in Glaucoma: Which Questions Should We Ask?		Prof Leopold SCHMETTERER
0948 – 1000	How AI will help Tele-Ophthalmology		Dr LIU Yong
1000 – 1012	Application of Machine Learning in Genomic Data		Prof CHENG Ching-Yu
1012 – 1024	Challenges in Automated Retinal Imaging		Dr Gilbert LIM
1024 – 1030	Panel Discussion		
1030 – 1100	**Coffee & Tea Break / Trade Exhibition**		**AUDITORIUM FOYER, LEVEL 1**
1100 – 1300	**APTOS SYMPOSIUM 4: GLOBAL TELE-OPHTHALMOLOGY INITIATIVES**		**AUDITORIUM, LEVEL 1**
Moderator	**Dr Gavin TAN, A/Prof Paisan RuamviboonsUK, Prof Paul FOSTER**		
1100 – 1112	Disruptive Methodologies in Preventing Blindness in Malaysia?		Dr Nor Fariza NGAH
1112 – 1124	Retinal Vascular Image Analysis in Assessment of Vascular Health in Childhood Cancer Survivors		Dr Tengku Ain Fathlun Binti TENGKU KAMALDEN
1124 – 1136	Real-World Applying AI and Tele--Ophthalmology: Lessons Learnt from Thailand		A/Prof Paisan RUAMVIBOONSUK
1136 – 1148	Development of Rapid Assessment of Diabetic Retinopathy (RADR) System for Rural Areas in Indonesia		Dr Muhammad Bayu SASONGKO
1148 – 1200	New Models of Care for Chronic Eye Disease to Meet Growing Demand in the UK		Prof Paul FOSTER
1200 – 1212	The Beijing Eye Public Health Care Study: Tele-Ophthalmology and Its Application		Prof Jost JONAS
1212 – 1224	Tele-Ophthalmology Initiatives in India - Aravinds' Experience		Dr Karthik SRINIVASAN
1224 – 1236	Tele-Ophthalmology – Our Experience at the National Healthcare Group Eye Institute		A/Prof Colin TAN
1236 – 1248	The Utility of Tele-Ophthalmology Principles in An Eye Hospital		Dr Dawn SIM
1248 – 1300	Panel Discussion		
1300 – 1315	**HANDOVER OF FLAG & BIG DATA CHALLENGE OVERVIEW**		**AUDITORIUM, LEVEL 1**
1315 – 1345	**Lunch / Trade Exhibition**		**AUDITORIUM FOYER, LEVEL 1**
1345 – 1430	**LUNCH SYMPOSIUM** ***(SPONSORED BY TOPCON)*** **TELE-SCREENING FOR DIABETIC RETINOPATHY AND OTHER RETINAL DISEASES: NOW AND FUTURE**		**AUDITORIUM, LEVEL 1**
	Developing a Comprehensive Tele-Screening Program for Diabetic Retinopathy: The SiDRP Experience		Dr Gavin TAN
	Artificial Intelligence for Diabetic Retinopathy Screening		Dr Daniel TING
1430 – 1600	**FREE PAPER SESSION I**	**AUDITORIUM, LEVEL 1**	**LI-S1, Level 1**
Moderator	**Dr Gavin TAN, Dr Robert CHANG**		
1430 – 1440	Effectiveness of Tele-Retinal Imaging in Identifying Diabetic Retinopathy Compared with Universal Referral – A Cluster-Randomised Trial	Mr Sanil JOSEPH	**Concurrent Session AI Workshop** Mr Wei Meng, China
1440 – 1450	A Deep Learning System for Detecting Glaucomatous Optic Neuropathy from Volumetric Spectral-Domain Optical Coherence Tomography Images	Ms Anran RAN	
1450 – 1500	Routine Fundus Photography Screening for Posterior Segment Disease in Vision Centers: A Stepped-Wedge, Cluster-Randomised Trial in South India	Dr Sankalp SHARMA	
1500 – 1510	Indian Urban Rural Diabetic Retinopathy Eye Study Using Low Cost Fundus Camera	Dr Gaurav MATHUR	
1510 – 1520	Tele-Ophthalmology - Reaching the Unreached and Preventing Blindness in India	Dr Senthil TAMILARASAN	
1520 – 1530	eyeSmart App Tele-Ophthalmology: A Novel Method of Rural Eye Care Delivery Connecting Tertiary Centre and Vision Centres in India	Dr Anthony Vipin DAS	
1530 – 1540	Smart Cornea Services Role of Smartphone Based Applications in Reaching Out to Rural India	Dr Madhu UDDARAJU	
1540 – 1550	Novel Technique of Smartphone Based High Magnification Imaging of the Eyelid Lesions	Dr Ashish AHUJA	
1550 – 1600	A Novel Ultra Wide-Field Smartphone Ophthalmoscope for Tele-Medicine and Self-Monitoring	Dr Kenny LAI	

3RD ASIA PACIFIC TELE-OPHTHALMOLOGY SYMPOSIUM 2018
DAY 2: SUNDAY, 8 JULY 2018 *(continued)*

1600 – 1605	APTOS Young Innovator Travel Grants Presentation	
1605 – 1630	**Coffee & Tea Break / Trade Exhibition**	**AUDITORIUM FOYER, LEVEL 1**
1630 – 1740	**FREE PAPER SESSION II**	**AUDITORIUM, LEVEL 1**
Moderator	**Dr Daniel TING, Dr Lily PENG**	
1630 – 1640	Pilot Study Comparing Ophthalmic Diagnoses and Recommended Management: Rural Outreach Tele-Ophthalmology Versus Face-To-Face Examination	Dr Steve BARTNIK
1640 – 1650	Effectiveness of Artificial Intelligence (AI) for Diabetic Retinopathy (DR) Screening	Dr Divyansh MISHRA
1650 – 1700	Cornea Practice in Remote Rural Set Up with the Help of Robotic Tele-Ophthalmic Slit Lamp	Dr Mukesh TANEJA
1700 – 1710	An Evaluation of OCT Scans Using a Deep Learning Based Hierarchical System	Dr Rekha SHARMA
1710 – 1720	An Evaluation of An Artificial Intelligence Based Diabetic Retinopathy Classifier Against Expert Clinicians	Dr Rekha SHARMA
1720 – 1730	Fast Offline Artificial Intelligence Assistant for Screening Diabetic Retinopathy	Mr Florian M. SAVOY
1730 – 1740	Automatic Classification of Diabetic Retinopathy Using Wide Fundus Images	Dr Kangrok OH
1630 – 1740	**CLOSING REMARKS**	**AUDITORIUM, LEVEL 1**
1740 – 1745	Closing Speech by Congress President, 3rd APTOS 2018	Dr Gavin TAN
1745 – 1750	Closing Speech by Council President, APTOS	Prof HE Mingguang
1750	**End of Day 2**	

VENUE INFORMATION



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Auditorium	Main Symposium
L1-S1	APTOS Council Meeting & Annual General Meeting AI Workship
L1-S3	Speakers' Prep Room & Secretariat Room
SNEC Lobby	Welcome Reception

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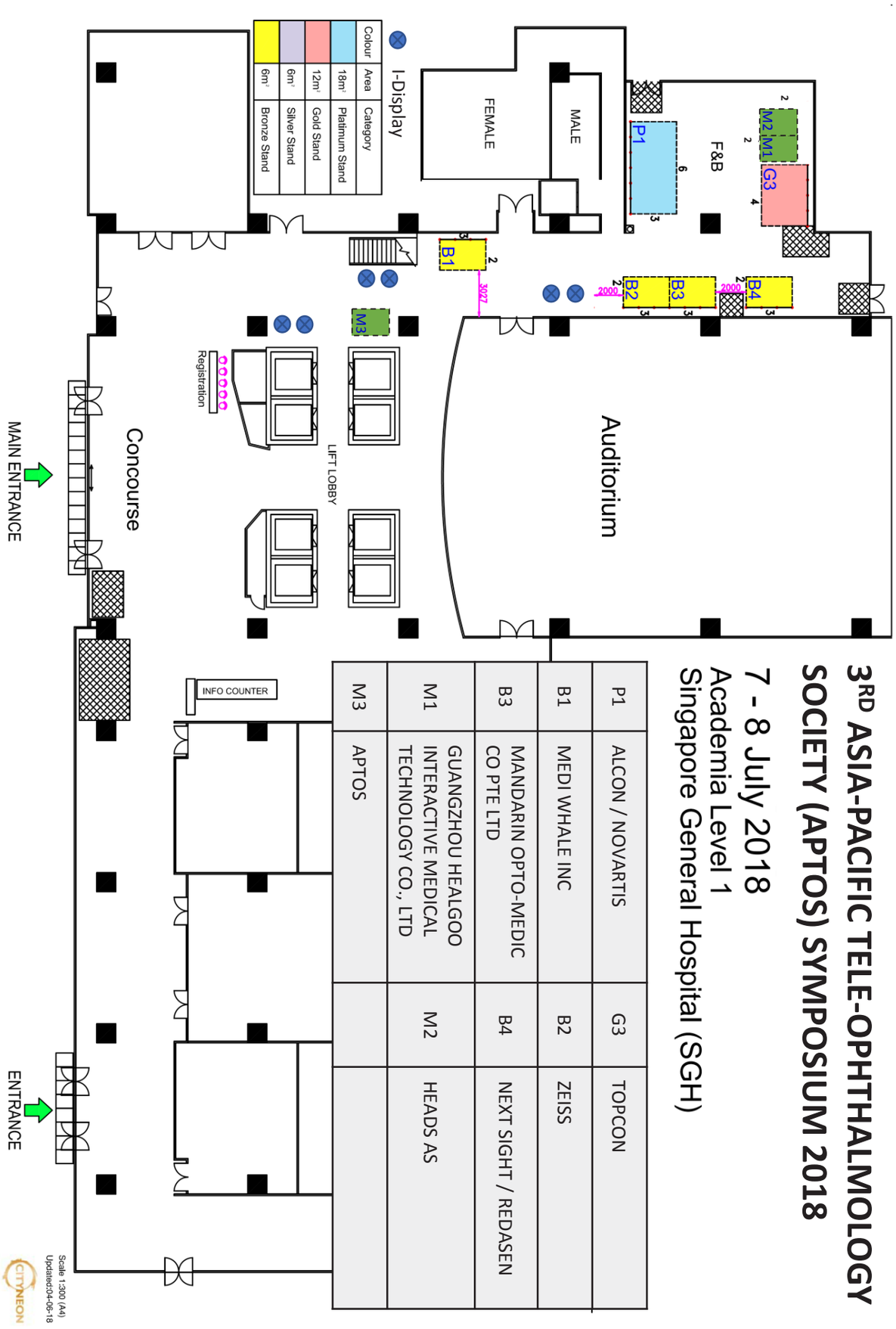

APTOS YOUNG INNOVATOR TRAVEL GRANTS

Sanil JOSEPH, MHA, MSc
Aravind Eye Care System, Madurai, Tamilnadu, India

EFFECTIVENESS OF TELE-RETINAL IMAGING IN IDENTIFYING DIABETIC RETINOPATHY COMPARED WITH UNIVERSAL REFERRAL-A CLUSTER-RANDOMISED TRIAL

Sanil Joseph MHA, MSc, Ramasamy Kim DO, DNB, Ravilla D Ravindran MS, DO, Astrid E Fletcher PhD, Thulasiraj D. Ravilla MBA

Purpose:
To evaluate the effectiveness of teleretinal screening and hospital referral (TR) in diabetic patients compared with offering all diabetics a hospital referral (UR).

Methods:
This was a cluster randomized trial of diabetes clinics in which, eight clinics were equally randomized to either TR (n=401) or UR (n=400). In TR, non-mydriatic 3 field 45º retinal images were remotely graded by a retinal specialist and those with DR or probable DR or ungradable images were referred to hospital for a retinal examination. In UR, all patients were referred for a retinal examination at AEH.

Results:
In TR, 96 of 398 patients who underwent teleritinal imaging were referred to AEH with probable DR (53) or non-gradable images (43). Hospital attendance at AEH was proportionately higher in TR, n=54 of 96 referred (56%) compared to UR, n=150 of 400 referred, (38%). The intention to treat analysis based on all patients eligible for referral in each arm showed proportionately more TR patients (36/96, 37.5.0%) were diagnosed with DR compared to UR (50/400, 12.5%) (unadjusted incidence rate ratio (IRR) = 3.00; 95% CI 2.01, 4.48). These results were little changed by inclusion of all covariates, IRR=2.72; 1.90, 3.91). IRR was lower in the per protocol analysis based on all who complied with referral, covariate adjusted IRR=1.75; 1.12, 2.44). Age, being women and hypertension diagnosis were factors associated with lower attendance.

Conclusions:
The proportionate yield of DR cases was higher in TR arm confirming the benefit of a targeted referral approach using teleretinal screening to identify those with probable DR.

Anran RAN, MD, PhD
The Chinese University of Hong Kong, Hong Kong

A DEEP LEARNING SYSTEM FOR DETECTING GLAUCOMATOUS OPTIC NEUROPATHY FROM VOLUMETRIC SPECTRAL-DOMAIN OPTICAL COHERENCE TOMOGRAPHY IMAGES

Purpose:
Population screening for glaucoma is labour-intensive and time-consuming. We aim to develop and train a deep learning convolutional neural network (CNN) using 3D volumetric spectral-domain optical coherence tomography (SDOCT) images for glaucomatous optic neuropathy (GON) detection, which will make glaucoma screening much more cost-effective and practical.

Methods:
Volumetric SDOCT images (optic disc cube scan with 200x1024x200) of Cirrus HD-OCT were extracted from glaucoma and control subjects in the CUHK Eye Centre. Each scan was labelled as Yes/No insufficient image quality and Yes/No GON. GON was defined as retinal nerve fiber layer thinning on reliable SDOCT images, with a structural defect that correlated in position with the visual field defect. The data were randomly split into two sets with a ratio of 7:3 for training the model and evaluating the diagnostic performance, respectively. We used a state-of-the-art 3D implementation of ResNet34 to construct the CNN architecture. Receiver operation characteristics (ROC) curve and the area under the curve (AUC) was used to measure the sensitivity-specificity trade-off. Sensitivity, specificity and accuracy were then calculated.

Results:
A total of 1,192 and 912 volumetric scans from 208 glaucoma patients and 150 control subjects were included, respectively. In the testing, the CNN model was able to detect GON with an AUC of 0.933. Based on the ROC, the model achieved an overall accuracy, sensitivity, specificity of 86.2%, 81.0% and 93.1%, respectively.

Conclusions:
Our proposed deep learning system, using 3D volumetric SDOCT images as the inputs into the Resnet 34 CNN model, archived good diagnostic performance to discriminate GON.

Sankalp Singh SHARMA, DO, DNB
Aravind Eye Hospital, India

ROUTINE FUNDUS PHOTOGRAPHY SCREENING FOR POSTERIOR SEGMENT DISEASE IN VISION CENTERS: A STEPPED-WEDGE, CLUSTER-RANDOMISED TRIAL IN SOUTH INDIA

Sankalp Sharma, DO, DNB1; Nakul S. Shekhawat, MD, MPH2; Rengaraj Venkatesh, DO,DNB1; Sanil Joseph, MHA,MSc 1; Alan L. Robin, MD2; David C. Musch, PhD, MPH2; Maria A. Woodward, MD, MS2
1Aravind Eye Hospital, India
2W.K. Kellogg Eye Center, University of Michigan Health System, Ann Arbor, MI, USA

Purpose:
Determine if routine fundus photography increases detection of posterior segment disease (PSD) in a community setting.

Methods:
Stepped-wedge, cluster-randomized trial of 1990 patients presenting for tele-consultation at 4 community eye clinics at the Aravind Eye Care System in Pondicherry, India. Clinics were randomized to optional (control) or routine fundus photography. The proportion of patients with any PSD, referral-warranted PSD, and sight-threatening disease was compared across groups.

Results:
Compared to controls (N=853), patients undergoing routine fundus photography (N=1137) had higher percentages of posterior segment disease (16.5% vs. 5.5%, $p<0.001$), referral-warranted posterior segment disease (12.0% vs. 4.5%, $p<0.001$), and referral-warranted posterior segment disease specifically found on photography (12.0% vs. 4.5%, $p<0.001$). Both groups had similar percentages of sight-threatening disease among those referred (9.4% vs. 10.2%, $p=0.738$), while patients undergoing routine fundus photography had slightly higher percentage of any sight-threatening disease detected (3.7% vs. 3.0%, $p<0.001$).

Conclusion:
Routine fundus photography in the community setting of vision centers significantly increases detection of referral-warranted disease, and slightly increases detection of immediately sight-threatening disease.

ABSTRACT LISTING

ABST_008	**Indian Urban Rural Diabetic Retinopathy Eye Study Using Low Cost Fundus Camera** Dr Gaurav Mathur, EYE Q, India
ABST_009	**Effectiveness of Tele-Retinal Imaging in Identifying Diabetic Retinopathy Compared with Universal Referral - A Cluster-Randomised Trial** Mr Sanil Joseph, Aravind Eye Care System, Madurai, Tamilnadu, India
ABST_010	**Tele-Ophthalmology - Reaching the Unreached and Preventing Blindness in India** Dr Senthil Tamilarasan, Welcare Health Systems Pvt Ltd, India
ABST_011	**eyeSmart App Tele-Ophthalmology: A Novel Method of Rural Eye Care Delivery Connecting Tertiary Centre and Vision Centres in India** Dr Anthony Vipin Das, L V Prasad Eye Institute, India
ABST_012	**Performance of a Deep Learning Algorithm for Detecting Late Age-Related Macular Degeneration on Fundus Photographs by Different Levels of Manual Grading Complexity** Dr Zhixi Li, Zhongshan Ophthalmic Center, Sun Yat-sen University, Guangzhou, China
ABST_017	**Smart Cornea Services Role of Smartphone Based Applications in Reaching Out to Rural India** Dr Madhu Uddaraju, Srikiran Institute of Ophthalmology, India
ABST_020	**Prediction of Retinal Nerve Fiber Layer Thickness Maps in Glaucoma Using Spatio-Temporal Model** Dr Yu Chak Yan Marco, Hang Seng Management College, Hong Kong
ABST_024	**Do It Yourself: Reduced Eye for Fundus Examination** Dr Ashish Ahuja, Seth GS Medical College and KEM Hospital, India
ABST_027	**Novel Technique of Smartphone Based High Magnification Imaging of the Eyelid Lesions** Dr Ashish Ahuja, Seth GS Medical College and KEM Hospital, India
ABST_028	**Optimisation and Construction of Coaxial Illuminated Handheld Fundus Camera for Tele-Retinal Screening** Dr Hanjo Kwon, Medical Research Institute, South Korea
ABST_029	**Smart Phone Based Monochromatic Green Filter Fundus Imaging** Dr Ashish Ahuja, Seth GS Medical College and KEM Hospital, India
ABST_032	**A Study to Analyse Tele-Medicine Diagnostic Accuracy for Retina Diseases** Dr Ashish Ahuja, Seth GS Medical College and KEM Hospital, India
ABST_033	**Diabetes at Baseline and its Association with the Developing Glaucoma in 10 Years in a Large Australian Cohort: The 45 and Up Study** Ms Yu Jiang, Zhongshan Ophthalmic Center (ZOC),Sun Yat-sen University, China
ABST_034	**Diagnostic Value of Choroidal Thickness in Patients with Myopic Macular Degeneration: The ZOC-BHVI High Myopia Cohort Study** Ms Chimei Liao, Zhongshan Ophthalmic Center, China
ABST_035	**Characteristics of Peripapillary Intrachoroidal Cavitation in Highly Myopic Eyes: The ZOC-BHVI High Myopia Cohort Study** Dr Xiaotong Han, Zhongshan Ophthalmic Center, China
ABST_036	**A Deep Learning System for Detecting Glaucomatous Optic Neuropathy from Volumetric Spectral-Domain Optical Coherence Tomography Images** Ms Anran Ran, The Chinese University of Hong Kong, Hong Kong
ABST_037	**Comparison of Diagnostic Concordance Amongst a Deep Learning, Graders and Ophthalmologists** Dr Zhixi Li, Zhongshan Ophthalmic Center, Sun Yat-sen University, Guangzhou, China
ABST_038	**Tele-Ophthalmology Screening in the Community Using a Hand-Held Fundus Camera** Ms Dilys Lee, National University of Singapore, Singapore
ABST_039	**Quantification of Biological Age Using Fundus Images Through Deep Neural Network** Dr Wei Wang, Zhongshan Ophthalmic Center, Sun Yat-sen University, China
ABST_040	**Development of Decision Support Software for Automatic Retina Diseases Detection Using Deep Learning** Dr Su Jeong Song, Kangbuk Samsung Hospital, Sungkyunkwan University, School of Medicine, South Korea
ABST_042	**A Novel Ultra Wide-Field Smartphone Ophthalmoscope for Tele-Medicine and Self-Monitoring** Dr Kenny Lai Ho Wa, Tuen Mun Hospital, Hong Kong
ABST_043	**Lions Outback Vision Tele-Ophthalmology Service: Lessons Learned from Consecutive Audits** Dr Steve Bartnik, Lions Eye Institute, Australia
ABST_044	**Pilot Study Comparing Ophthalmic Diagnoses and Recommended Management: Rural Outreach Tele-Ophthalmology versus Face-to-Face Examination** Dr Steve Bartnik, Lions Eye Institute, Australia

ABSTRACT LISTING

ABST_045	**Routine Fundus Photography Screening for Posterior Segment Disease in Vision Centers: A Stepped-Wedge, Cluster-Randomised Trial in South India** Dr Sankalp Sharma, Aravind Eye Hospital, India
ABST_046	**Performance of A Deep Learning Algorithm for Detecting Age-related Macular Degeneration on Color Fundus Photographs** Ms Feng Chen, Zhongshan Ophthalmic Center, China
ABST_047	**How To Train A Deep Learning System to Classify Diabetic Retinopathy Fundus Data** Prof Robert Lufkin, UCLA, USA
ABST_048	**Effectiveness of Artificial Intelligence (AI) for Diabetic Retinopathy (DR) Screening** Dr Divyansh Mishra, Sankara Eye Hospital, Bangalore, India
ABST_050	**Risk of Retinal Artery Occlusion in Patients with Diabetes Mellitus: A Retrospective Large-scale Cohort Study** Dr Chang Yuh-Shin, Chi Mei Medical Center, Taiwan
ABST_052	**Cornea Practice in Remote Rural Set Up with the Help of Robotic Tele-Ophthalmic Slit Lamp** Dr Mukesh Taneja, L V Prasad Eye Institute, India
ABST_053	**Personalised Glaucoma Progression Prediction: An Implementation-Focused Perspective** Mr Nguyen Duc Quang, Singapore Eye Research Institute, Singapore
ABST_054	**An Evaluation of OCT Scans Using a Deep Learning Based Hierarchical System** Dr Rekha Sharma, SigTuple Technologies, India
ABST_055	**An Evaluation of An Artificial Intelligence Based Diabetic Retinopathy Classifier Against Expert Clinicians** Dr Rekha Sharma, SigTuple Technologies, India
ABST_057	**Research on Cloud Platform of Adolescent Eye Health Based on Big Data** Ms Miao Wenjie, Changsha Aier Eye Hospital, China
ABST_061	**Fast Offline Artificial Intelligence Assistant for Screening Diabetic Retinopathy** Mr Florian M. Savoy, Medios Technologies, Singapore
ABST_062	**Diffuse Chorioretinal Atrophy in Chinese High Myopia: The ZOC-BHVI High Myopia Cohort Study** Dr Liu Ran, Zhongshan Ophthalmic Center, China
ABST_063	**Automatic Classification of Diabetic Retinopathy Using Wide Fundus Images** Dr Kangrok Oh, Yonsei University, South Korea
ABST_064	**Community-Based Optometry-Facilitated Tele-Ophthalmology: Comprehensive Eye-Care Services in Patients with Intellectual Disabilities in Taiwan** Dr Hsieh Ching-Ju, Taipei City Hospital, Taiwan
ABST_066	**Easy Way of Developing An Personalised Android Application Using Basic Google Tools for Tele-Screening** Dr Divyansh Mishra, Sankara Eye Hospital, Bangalore, India
ABST_068	**A Dual-Channel Deep Learning Method for Automated Glaucoma Identification Using Stereo Disc Images** Dr You Yuyi, Save Sight Institute, Australia
ABST_070	**Tele-Ophthalmology: Barriers to Overcome for Smooth Eye Care Service Delivery in Static Outreach Center of Khulna, Bangladesh** Dr AKM Mamunur Rashid, Dry Eye Lab, Bangladesh

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NOTES

NOTES

NOTES

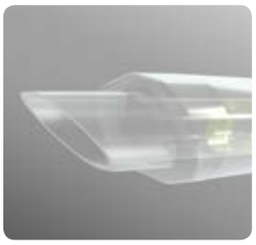
UltraSert™
PRE-LOADED DELIVERY SYSTEM

ULTRASERT™ PRE-LOADED DELIVERY SYSTEM

Exceptional control for your AcrySof® IQ IOL implantations

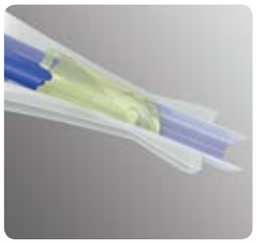
Smooth injection for controlled advancement[*,1,2]

The spring-controlled **TensionGlide™ plunger** is designed to provide a consistent level of resistance for **smooth, one-handed injection.**[*,1,2]



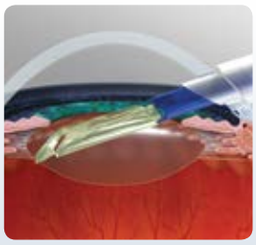
Preserved incisions with controlled insertion depth[1,3]

The **depth guard nozzle** is designed to preserve your intended incision architecture by **minimizing wound stretch** in incisions as small as 2.2mm.[3]



Consistent delivery with controlled haptic configuration...[1,3]

The UltraSert™ Pre-loaded Delivery System **plunger tip** is engineered to **ensure the trailing haptic remains tucked during insertion.**[1,3]



...and controlled placement in the capsular bag[1,3]

The **plunger tip** extends 6.5 mm past the nozzle without adhering to the IOL for **consistent IOL placement** into the capsular bag.[1,3]

*Out of 42 cataract surgeons who tried UltraSert™ System prototypes in an artificial setting, the majority spontaneously used "smooth" to describe the advancement of the plunger.

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UltraSert™ PRE-LOADED DELIVERY SYSTEM | Advancing CATARACT SURGERY

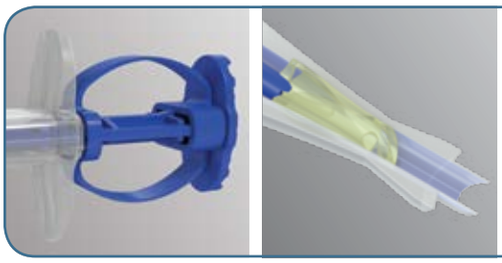
Three simple steps to prepare for controlled IOL delivery[1]

STEP 1: Inject OVD

Fill the front chamber with an approved viscoelastic.*

STEP 2: Remove lens stop and plunger lock

Remove the blue lens stop, followed by the blue plunger lock.



STEP 3: Advance and inspect

Advance the IOL into the haptic check position, where it's ready for inspection and delivery.

Experience the exceptional control of the UltraSert™ Pre-loaded Delivery System.[1-3]

*Consult your Alcon sales representative for a list of approved OVDs.

1. AcrySof® IQ Aspheric IOL with the UltraSert™ Pre-loaded Delivery System Directions for Use.
2. UltraSert™ Delivery System Prototype Human Factor Testing, February 2015.
3. Comparative Assessment of IOL Delivery Systems. Alcon internal technical report: TDOC-0018957. Effective Date 19 May 2015.

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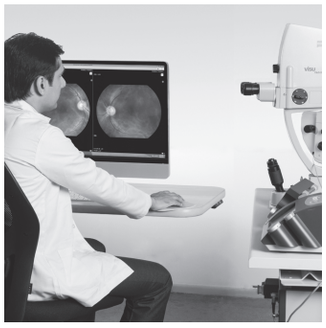
// ACQUISITION

Acquire. Transfer. Report.

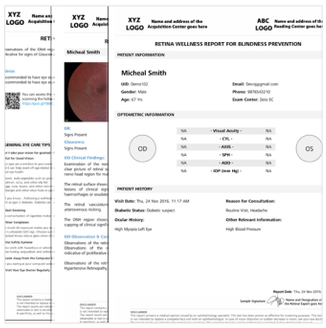
The fully web-enabled VISUHEALTH's acquisition module can be adapted in any type of health care practices. The acquisition module is comprised of a lightweight mobile VISUSCOUT® 100 fundus camera from ZEISS allowing great flexibility in reaching every patient needing retinal fundus examination.



// GRADING

Visualize. Assess. Recommend.

The reading module as part of the Solution is comprised of a smart and time-saving web-based Reading application, which assists retina experts in reading fundus images received from various acquisition centers.



// REPORTING

Interpret. Understand. Advise.

The DCP generates the Retina Wellness Report based upon the clinical inputs received from the reading center and sends it digitally to the respective acquisition center.

Scan the QR code with your SmartPhone to find out more about ZEISS VISUHEALTH Solution. For more information visit:
www.zeiss.co.in/remote-dr

Dr.Noon

for eye screening

This AI fundus-screening solution supports eye diesease diagnosis.
Due to the difficulty of eye examination, physicians cannot diagnose diabetic retinopathy although it is the most common diabetic complication. It helps diabetics to easily go through check-ups and physicians to provide advanced services.

Dr. Noon shows 95% accuracy from its own diagnosis. This accuracy was estimated from demonstrations.

Dr. Noon provides the result in less than 1 second. It will provide a rapid and easy examination

Intuitive UI

View all data at a glance through the patient list:
risk of disease, quality of image,
and real doctor's diagnosis notets.

Site of lesion

The site of lesion, which possibly a region where the disease occured, is marked in colours.
Lesion is more serious as it goes red-coloured.

Display of the state

Clearly displays current states of the fundus.
The top shows a general disease risk,
and the bottom shows analyzed result of particular diseases.

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Beyond Human Cognition

Medi Whale believes that there must be a new intelligence : an intelligence that keeps people healthy.
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