An AI-based diabetic retinopathy screening system and its use in real-world clinical settings in Australia and Singapore

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Abstract

Statement of the Problem: The World Health Organization announced in 2018 that 422 million people worldwide suffer from diabetes mellitus. The projected impact of vision impairment and blindness caused by Diabetic Retinopathy (DR) will result in significant public health and economic consequences. DR is preventable and treatable if detected early through an annual eye screening. However, screening rates are low globally due to a paucity of trained eye-health professionals in developing countries and in rural or remote areas of developed countries.

Method: Based on the research from CSIRO Australian e-Health Research Centre, TeleMedC group commercialized an AIbased Diabetic Retinopathy screening system-DR grader, an automated DR grading and preliminary referral decision support tool for patients with diabetes. The cloud-based tele-ophthalmology system has the functionalities of: (1) Deep learning based image quality assessment tool; (2) Deep learning based DR ???disease/no disease??? grading for color retinal images; (3) DR lesion localization and DR level indication; (4) Preliminary report of patient referral/no referral decision; and (5) DR disease audit by eye experts and developing patient referral pathway. DR grader has been deployed in a GP Super clinic at Midland, Western Australia from December 2016 onwards.

Results: Results of this implementation were published in a JAMA Network Open article (September 2018) evaluated a total of 291 patients. The system correctly identified all 12 patients with true disease (sensitivity 100%) and misclassified 23 patients as having disease (specificity 92%). The DR grader has been undergoing testing in Singapore since early 2018 at the Department of Ophthalmology, National University Hospital and in 30 GP clinics with similar or better preliminary results pending publication.

Conclusion: The AI-based DR screening system provides quick DR patient referral decision support in the primary care setting. It benefits patients from poorly-resourced and underserved remote areas for its low cost, time savings and high patient acceptability. The system was well received by primary care providers.

Biography:

Tan Teck Jack is the Chief Medical Officer of TeleMedC Group, an ophthalmic diagnostics technology company originating from Silicon Valley. He is the Founder and Medical Director of Northeast Medical Group. He has more than 20 years of experience in clinical work with managing a group of clinics, a specialist center and the group's HQ & pharmacy.