

ARVO 2024

View Abstract

CONTROL ID: 4049590**SUBMISSION ROLE:** Abstract Submission**AUTHORS****AUTHORS (LAST NAME, FIRST NAME):** Rudnicka, Alicja¹; Shakespeare, Royce¹; Fajtl, Jiri²; Chambers, Ryan³; Bolter, Louis³; Anderson, John³; Olvera-Barrios, Abraham⁴; Barman, Sarah²; Egan, Catherine A.⁴; Owen, Christopher¹; Tufail, Adnan⁴**INSTITUTIONS (ALL):** 1. PHRI, St George's University of London, London, London, United Kingdom.
2. Kingston University, London, United Kingdom.
3. Homerton Healthcare NHS Foundation Trust, London, United Kingdom.
4. Moorfields Eye Hospital NHS Foundation Trust, London, London, United Kingdom.**Commercial Relationships Disclosure:** Alicja Rudnicka: Commercial Relationship: Code N (No Commercial Relationship) | Royce Shakespeare: Commercial Relationship: Code N (No Commercial Relationship) | Jiri Fajtl: Commercial Relationship: Code N (No Commercial Relationship) | Ryan Chambers: Commercial Relationship: Code N (No Commercial Relationship) | Louis Bolter: Commercial Relationship: Code N (No Commercial Relationship) | John Anderson: Commercial Relationship: Code N (No Commercial Relationship) | Abraham Olvera-Barrios: Commercial Relationship: Code N (No Commercial Relationship) | Sarah Barman: Commercial Relationship: Code N (No Commercial Relationship) | Catherine Egan: Commercial Relationship: Code N (No Commercial Relationship) | Christopher Owen: Commercial Relationship: Code N (No Commercial Relationship) | Adnan Tufail: Commercial Relationship: Code N (No Commercial Relationship)**Study Group:** ARIAS Research Group**ABSTRACT****TITLE:** Evaluation of equity in performance of Artificial Intelligence for diabetic retinopathy (DR) detection**ABSTRACT BODY:****Purpose:** Given rising prevalence of diabetes, costs and workload associated with screening for diabetic eye disease is growing. Automated retinal image analysis systems (ARIAS) for DR offer a solution by partially replacing human grading of images. We examined performance equity in an independent head-to-head evaluation of ARIAS in a real-life setting.**Methods:** 8 out of 22 potentially eligible CE Class IIa systems for DR detection from retinal images agreed to participate. From 202,886 screening encounters at North East London Diabetic Eye Screening Programme (1st January 2021-31st December 2022) we curated a database of 1.2 million images and sociodemographic/grading data. Images were manually graded by up to 3 graders following a standard national protocol and final human grade in worst eye was used as the reference standard. ARIAS vendors received sample data from 1000 expired encounters (6000 images), national grading guidance and image capture protocols to confirm ARIAS outputs could be replicated in the research environment. Sensitivity and false-positive rates (95% confidence intervals) were determined by age quartiles, self-reported ethnicity (39% South Asians, 32% white and 17% of black) and sex according to level of DR. ARIAS outputs for test-positive/technical failure versus test-negative were compared with the standard. Vendor algorithms did not have access to human grading data.**Results:** Performance was stable across population subgroups of age, sex, ethnicity for moderate-to-severe non-proliferative DR and for proliferative DR, with sensitivities across vendors ranging from 95.6% (94.9%,96.2%) to 99.8% (99.6%,99.95%) and 96.8% (95.9%,97.5%) to 99.4% (98.9%,99.75%) respectively. Sensitivities for mild-to-moderate non-proliferative DR with referable maculopathy ranged from 73.9% to 98.3% with heterogeneity in performance by ethnicity/age groups for some vendors. Similarly false positive rates for no observable DR ranged from 4.3% to 61.4% and varied by population subgroups.**Conclusions:** Algorithms demonstrated safe levels of sensitivity for medium/high-risk DR in a real-world screening service which were equitable by subgroups of age, sex and ethnicity. For lower levels of DR or no DR, test positive rates varied by population subgroups. ARIAS can provide clinically equivalent, rapid detection DR for triaging no-DR/low vs. medium/high risk DR cases.

(No Image Selected)

Layman Abstract (optional): Provide a 50-200 word description of your work that non-scientists can understand. Describe the big picture and the implications of your findings, not the study itself and the associated details.: The English NHS Diabetic Eye Screening Programme generates over 10 million images of the back of the eye per year, which are graded for presence and severity of diabetic eye disease. Previous research has shown that automated technology for detecting diabetic eye diseases from eye images can identify images with diabetic retinopathy as well as human graders, which could significantly reduce workload. We evaluated 8 systems in 200,000 screening visits (~1.2 million images) and found they performed equitably well for all people with diabetes in detecting moderate-to-severe diabetic eye disease and could be used to triage into high-risk groups for human grading, and low risk groups not requiring human grading. This could help release the burden of human grading of all images and provide cost saving for the health service.

DETAILS

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Paper, #2 Poster

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