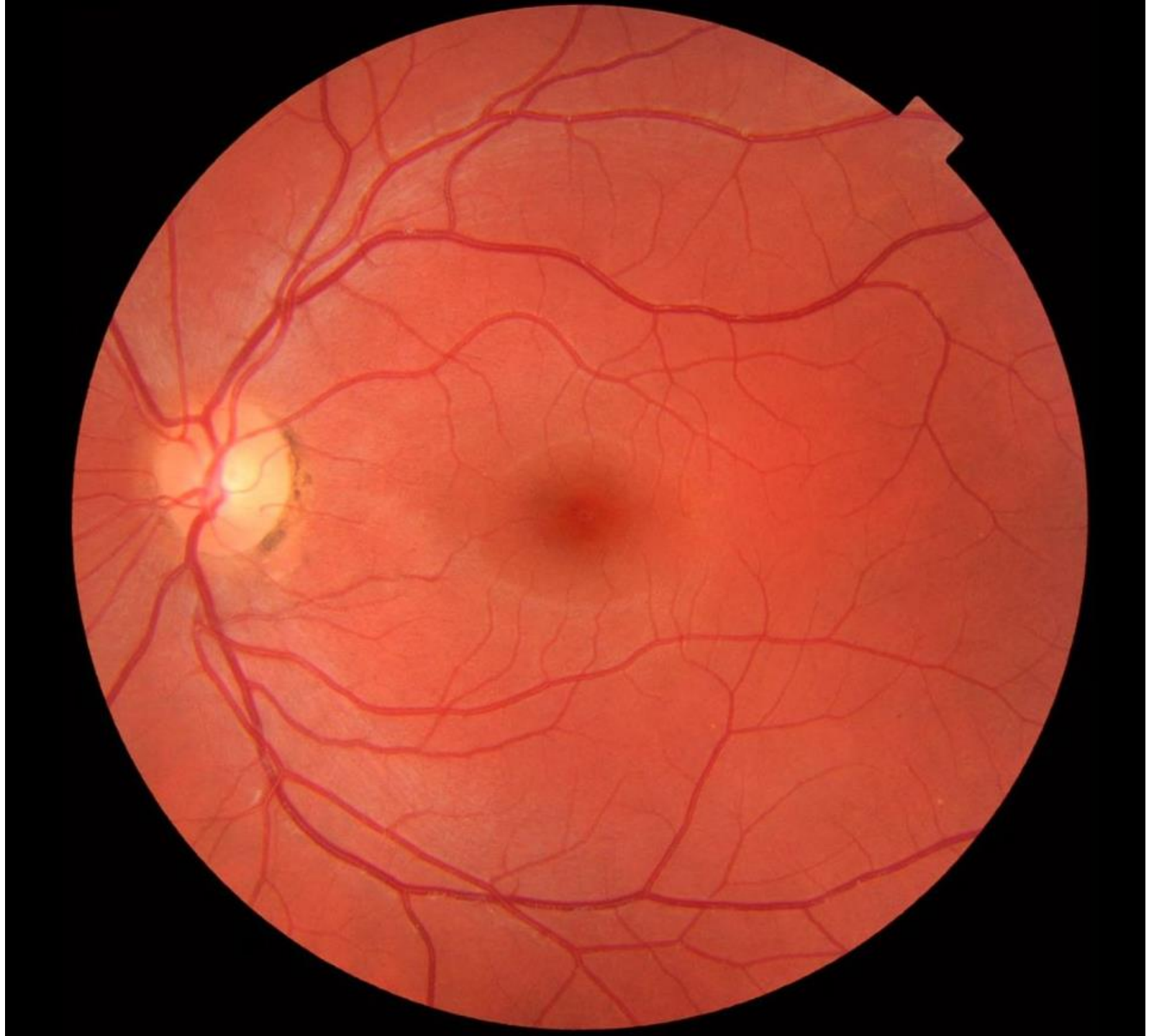
Lions Eye Institute

Lions Outback Vision

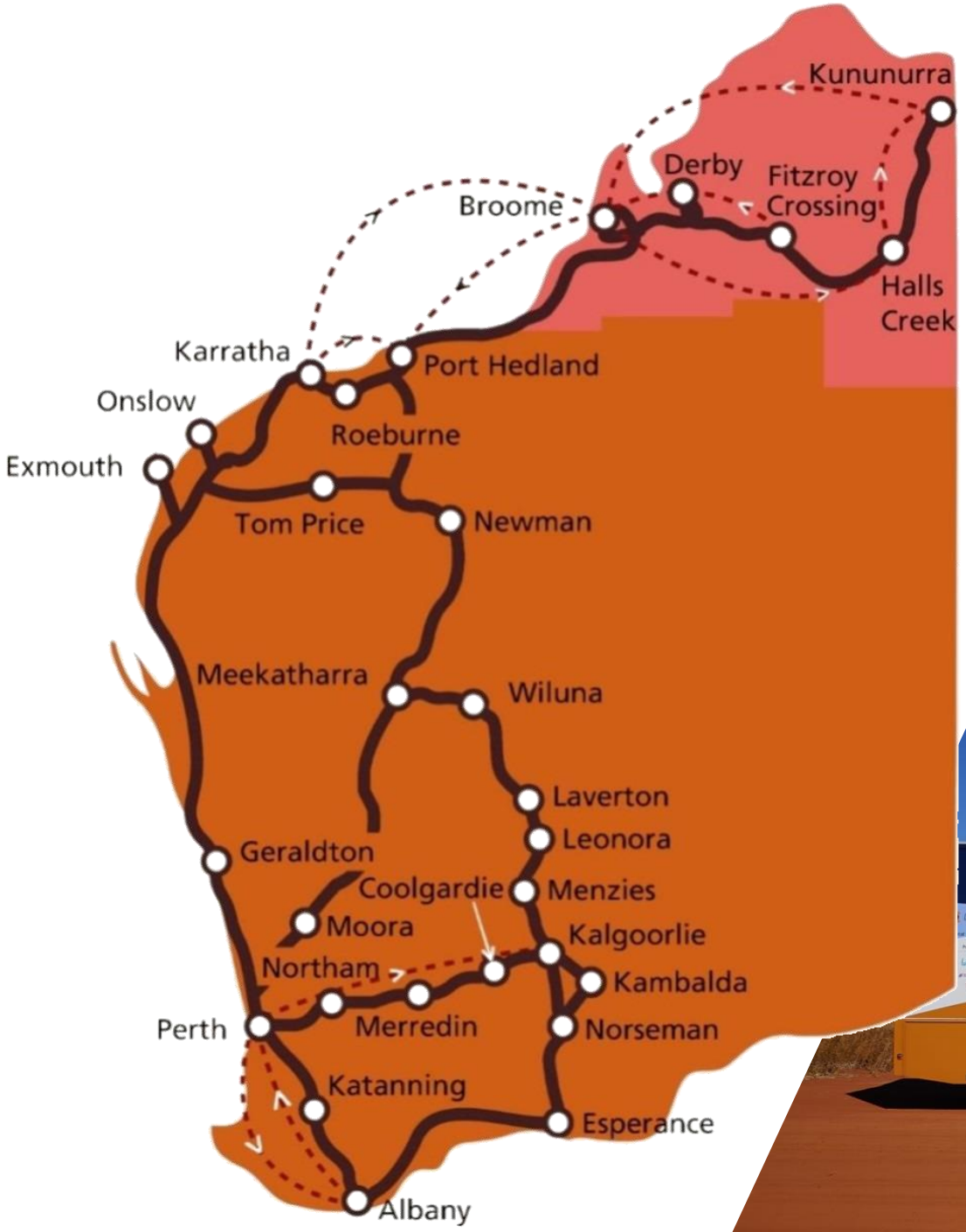
Eye screening powered by AI to transform primary care

Professor Angus Turner

Photo credits: "Lightning storm off Cooke Point, Port Hedland, Australia" by DrWang86 is licensed under CC BY 2.0. / "Dampier Salt evaporation flats, Port Hedland, 2023, 11" by Kgbo is licensed under CC BY-SA 4.0.



Are you worried?
Country Health Service
Pilbara


Kununurra
Derby
Fitzroy Crossing
Broome
Halls Creek
Karratha
Port Hedland
Onslow
Roeburne
Exmouth
Tom Price
Newman
Meekatharra
Wiluna
Laverton
Leonora
Geraldton
Coolgardie
Menzies
Moora
Kalgoorlie
Northam
Kambalda
Perth
Merredin
Norseman
Katanning
Esperance
Albany

STOP
STOP
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NORLASE
SENDER
KIMBERLEY PHARMACY
SERVICES

NORLASE

Chronic shortage of ophthalmology and optometry workforce

30% of Aboriginal people have Diabetes in the northwest

98% vision loss from Diabetic Retinopathy is preventable

20% get recommended eye screening

Past efforts for screening in primary care have failed

Technology trip-hazards prevent uptake

MBS Item numbers for DR Screening – 9 years

Item	Australia	WA
12325	8493	3500
12326	7498	5069

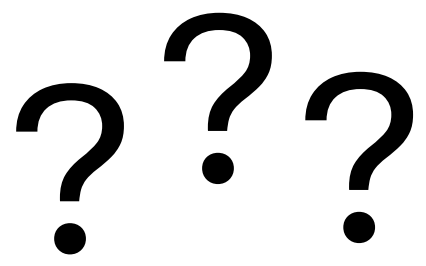
But there are 1.3 million patients living with Diabetes in Australia… ?

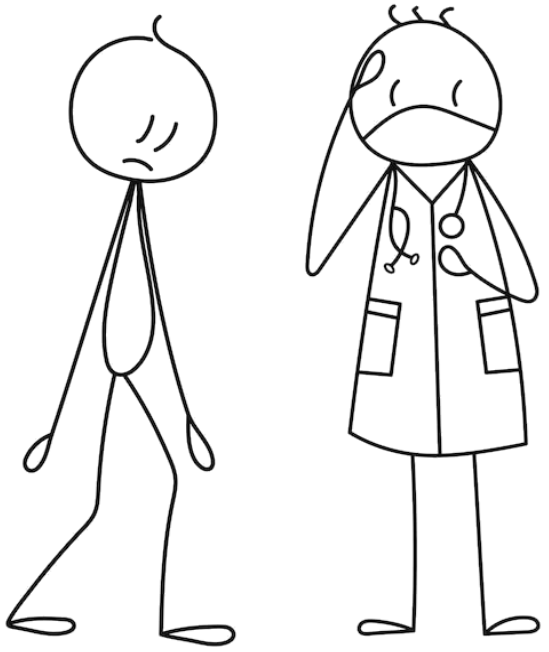
Please share your perspective on AI supported DR screening

Take the photo

Photo assessed

Follow up care





Verbatim

Monday
Tuesday
14
15
16
17
18
21
22
23
24
25
30
31

DRSplus

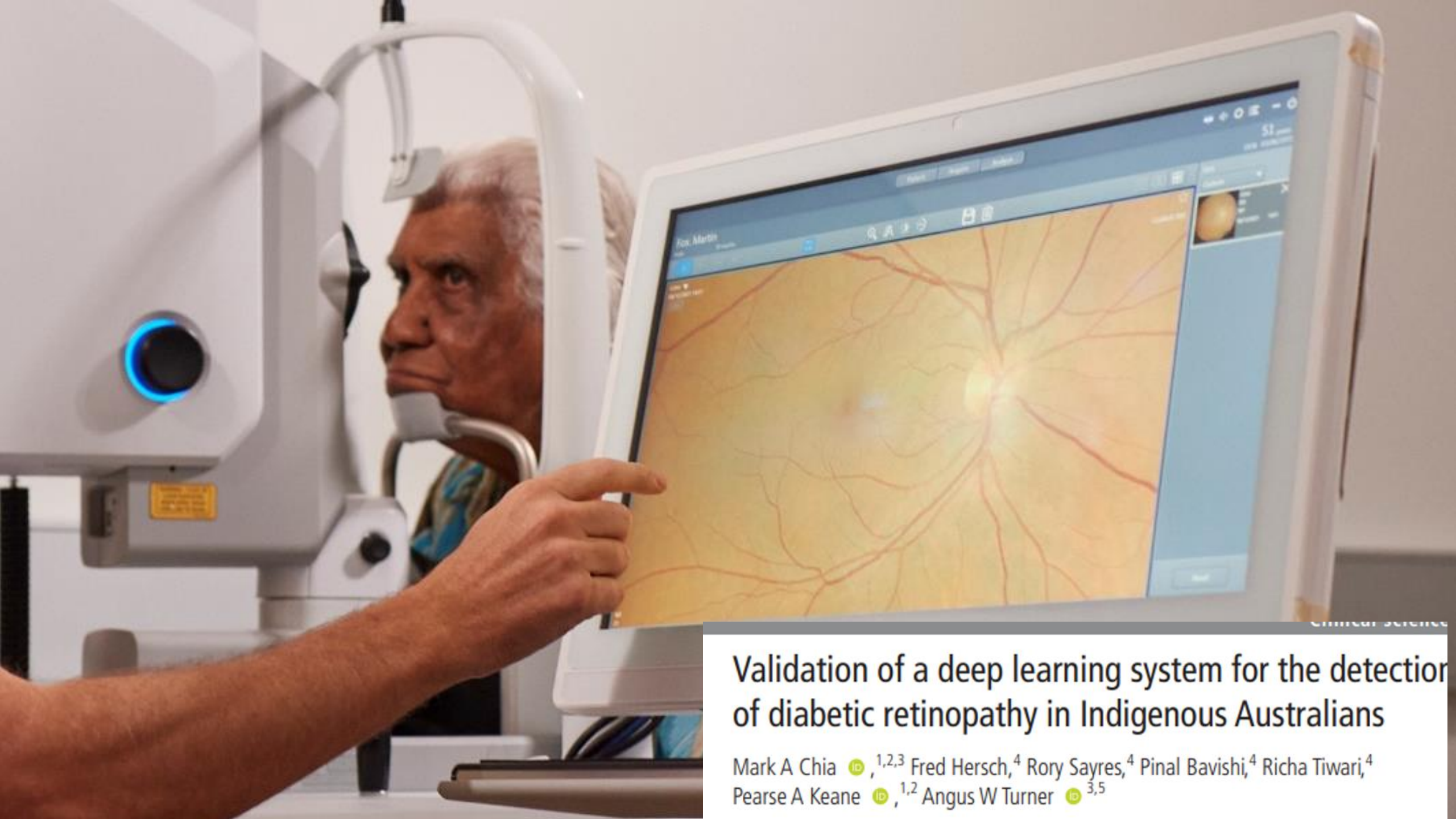
OPTOMED

NW500

Not all populations and settings are the same..

Subgroup	Sensitivity (%, 95% CI)	Specificity (%, 95% CI)	AUC (%, 95% CI)
Diabetes type			
Type 1	100.0 [39.8–100.0]	90.9 [81.3–96.6]	0.96 [0.92–0.99]
Type 2	96.4 [81.7–99.9]	85.3 [76.9–91.5]	0.91 [0.86–0.96]
Clinic			
Endocrinology	100.0 [71.5–100.0]	91.5 [85.6–95.5]	0.96 [0.93–0.98]
Aboriginal medical service	95.2 [76.1–99.9]	70.0 [4.86–81.4]	0.83 [0.73–0.92]
Camera model			
Canon	100.0 [59.0–100.0]	90.7 [82.5–95.9]	0.95 [0.92–0.98]
DRS	100.0 [63.1–100.0]	91.4 [82.3–96.8]	0.96 [0.92–0.99]
Topcon Maestro	94.1 [71.3–99.9]	53.3 [26.6–78.7]	0.74 [0.59–0.88]

Table 4. Sub-group analysis (n = 203).



Clinical Science

Validation of a deep learning system for the detection of diabetic retinopathy in Indigenous Australians

Mark A Chia [1,2,3] Fred Hersch,[4] Rory Sayres,[4] Pinal Bavishi,[4] Richa Tiwari,[4] Pearse A Keane [1,2] Angus W Turner [3,5]

PROOF OF CONCEPT

- Google AI was clear winner (n=317)
  - 100% sensitivity
  - 97.5% gradable
- Positive patient and stakeholder evaluation towards the use of AI
- 17 times more people screened

Google

ARDA: Automated Retinal Disease Assessment

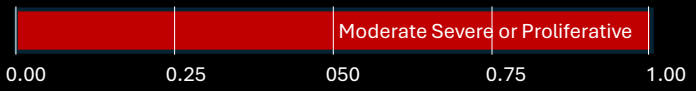
CHOOSE IMAGE

Drag another image to analyze or

FILE NAME (SIZE)
Uploaded retina image jpg (2.11M)

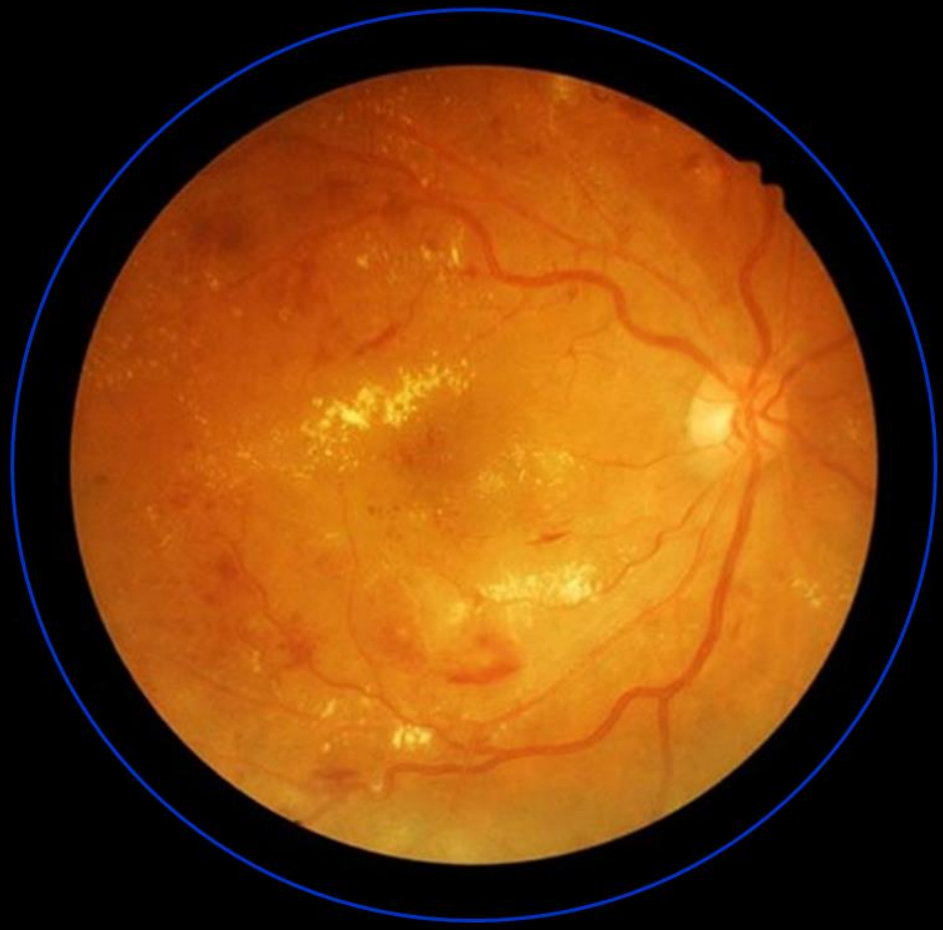
DIAGNOSIS ID
drw-2062

MODERATE DIABETIC RETINOPATHY REFERRABLE



DIABETIC MACULAR OEDEMA GRADE

DIABETIC RETINOPATHY GRADE



A new retinal camera

Remote nurse or health worker takes the photo opportunistically when seeing patient

AI provides on the spot diagnosis and health assessment

Immediate consult with specialist or GP as required via telehealth

DUZV

Anatomy of the eye

Australian Journal of Rural Health

WILEY

AJRH National Rural Health Alliance

ORIGINAL RESEARCH OPEN ACCESS

Implementation of A New, Mobile Diabetic Retinopathy Screening Model Incorporating Artificial Intelligence in Remote Western Australia

Qiang Li[1] | Jocelyn J. Drinkwater[1,2] | Kerry Woods[1] | Emma Douglas[1] | Alex Ramirez[1] | Angus W. Turner[1,2]

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Keywords: deep learning system | diabetes mellitus | diabetic retinopathy | remote | screening

ABSTRACT

Objective: Diabetic retinopathy (DR) screening rates are poor in remote Western Australia where communities rely on outdated

Partners on the ground

ICDC Integrated Chronic Disease Care Program

nintirri centre
Enriched lives. Thriving Communities

PAMS
Puntukurnu Aboriginal Medical Service

Aboriginal Health Council of Western Australia

Royal Flying Doctor Service

diabeteswa®

KARRATHA Central Healthcare

Government of Western Australia
WA Country Health Service

Funders

the Challenge
Reimagining regional and remote health care

telethon 7

The McCusker Charitable Foundation

The Fred Hollows Foundation

Technology partners (in kind)

TOPCON Healthcare
SEEING EYE HEALTH DIFFERENTLY

RetCAD™ by Thirona

OPTOMED

EyRIS

Research partners

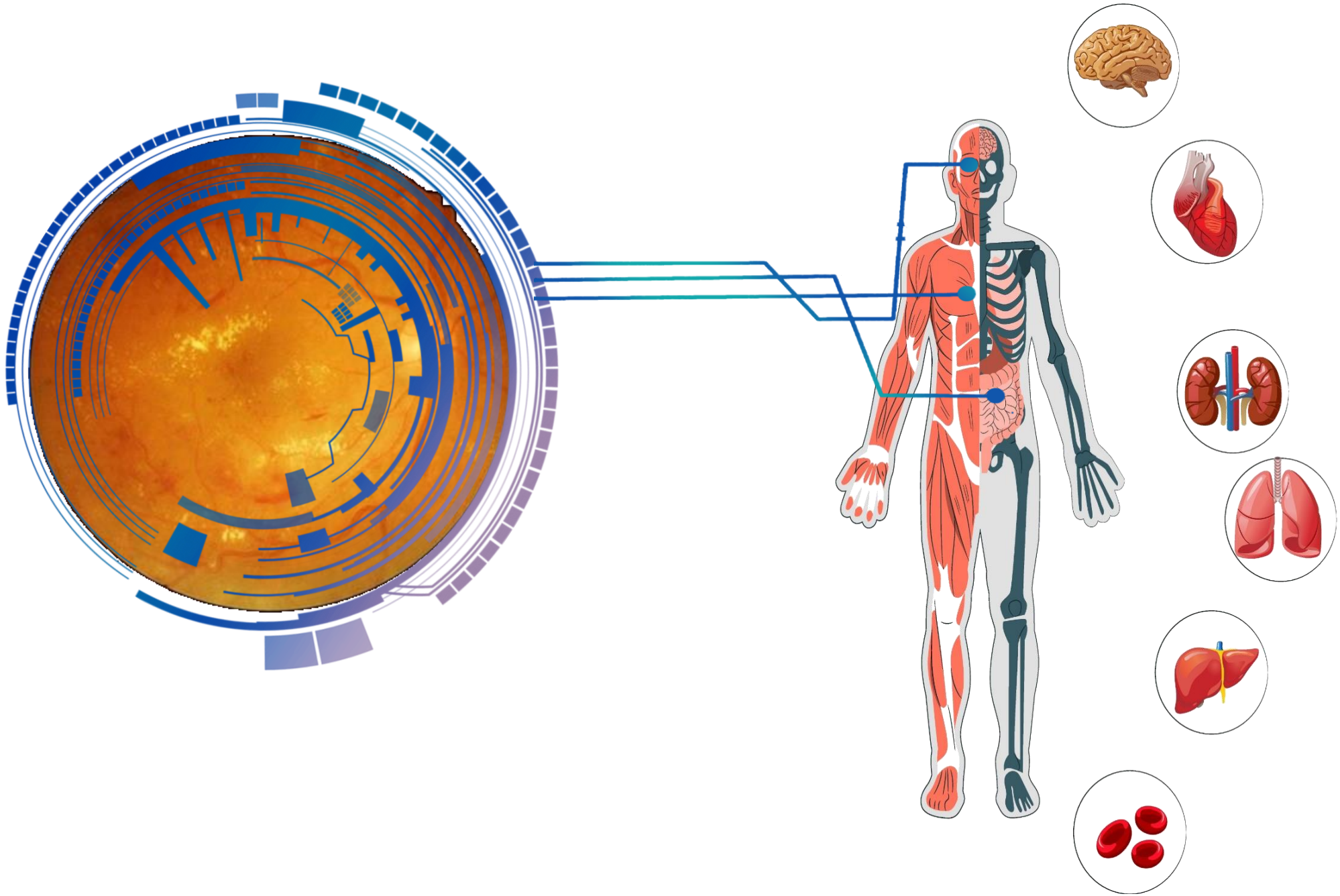
Google

THE UNIVERSITY OF WESTERN AUSTRALIA

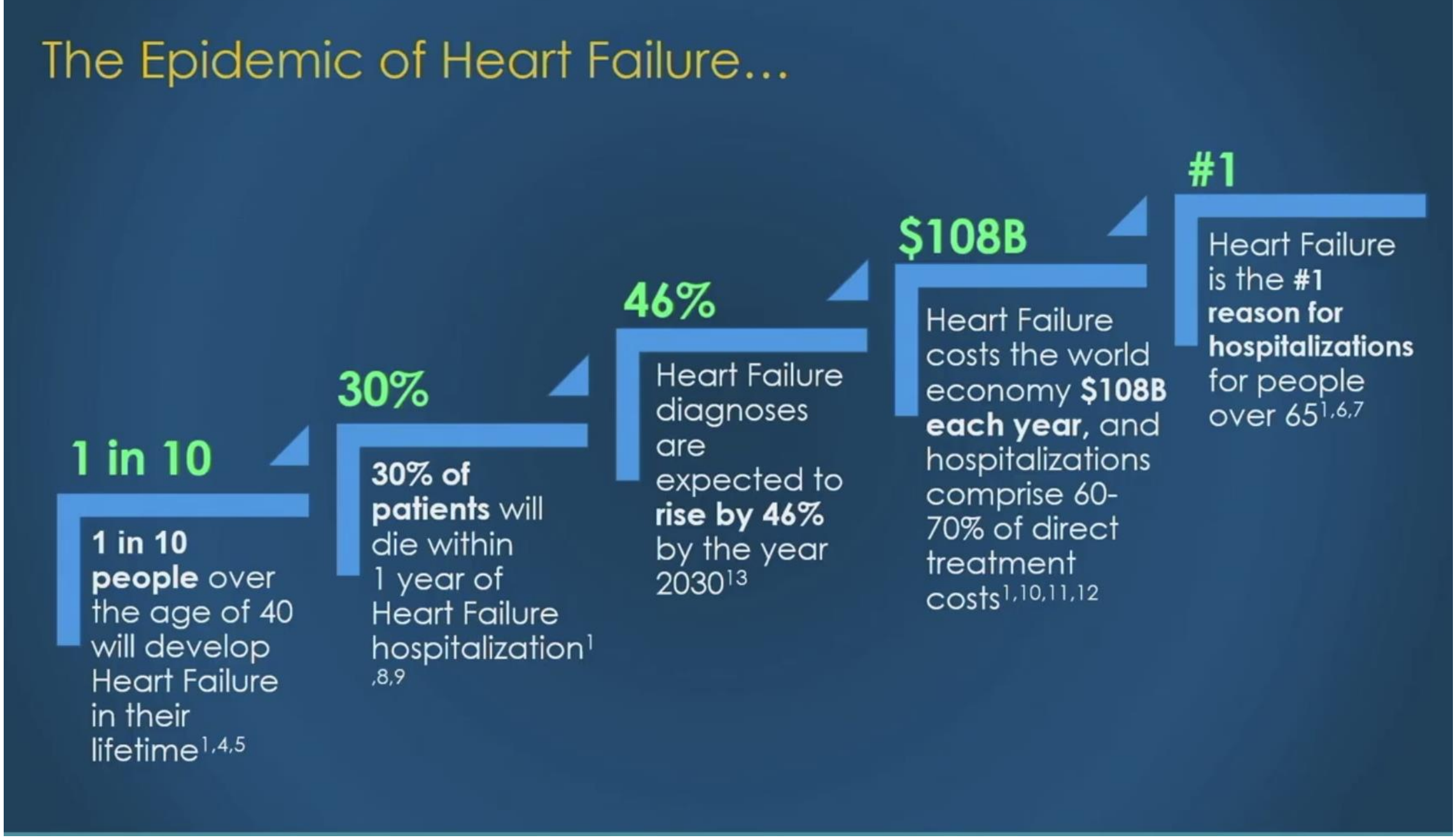
ARAVIND EYE CARE SYSTEM

UNIVERSITY OF OXFORD

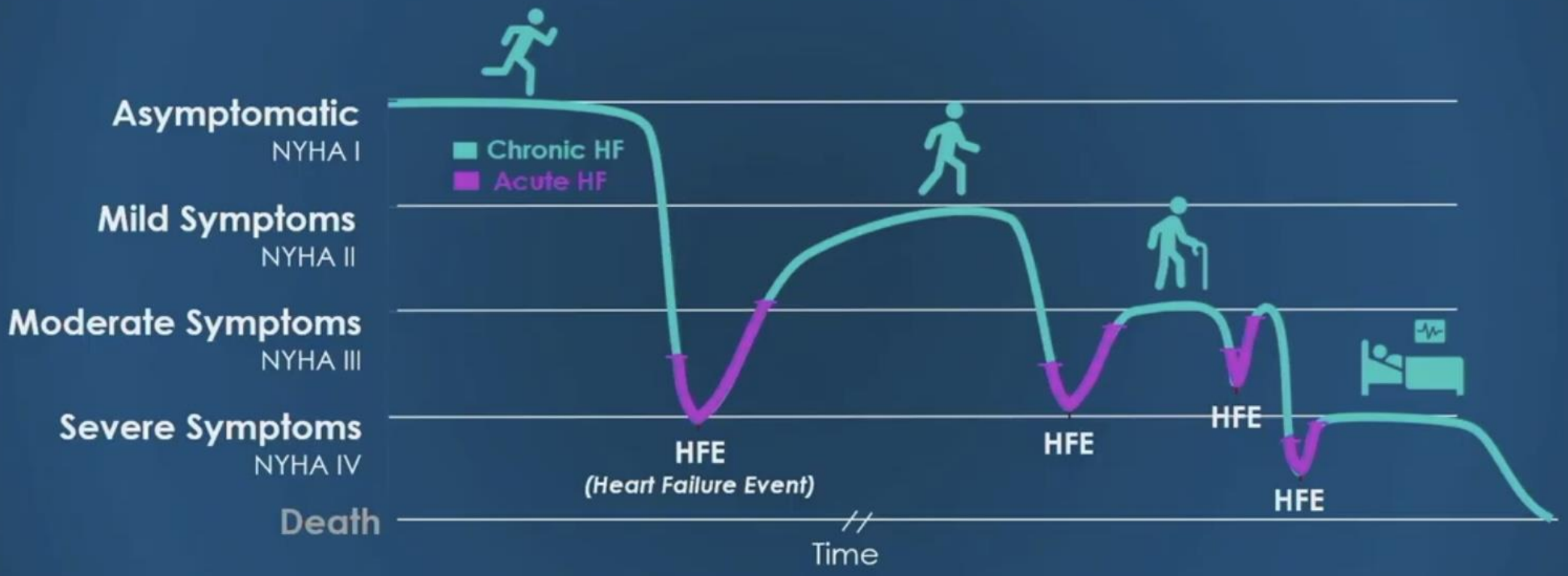
UCL



The Epidemic of Heart Failure…



Heart Failure impact on Quality of Life



Heart failure limits length of life and profoundly impacts function and quality of life[1]

[1] Goodlin, S. J Am Coll Cardiol 2009;54:386–96.

New diagnostic frontiers

Article

A foundation model for generalizable disease detection from retinal images

https://doi.org/10.1038/s41586-023-06555-x

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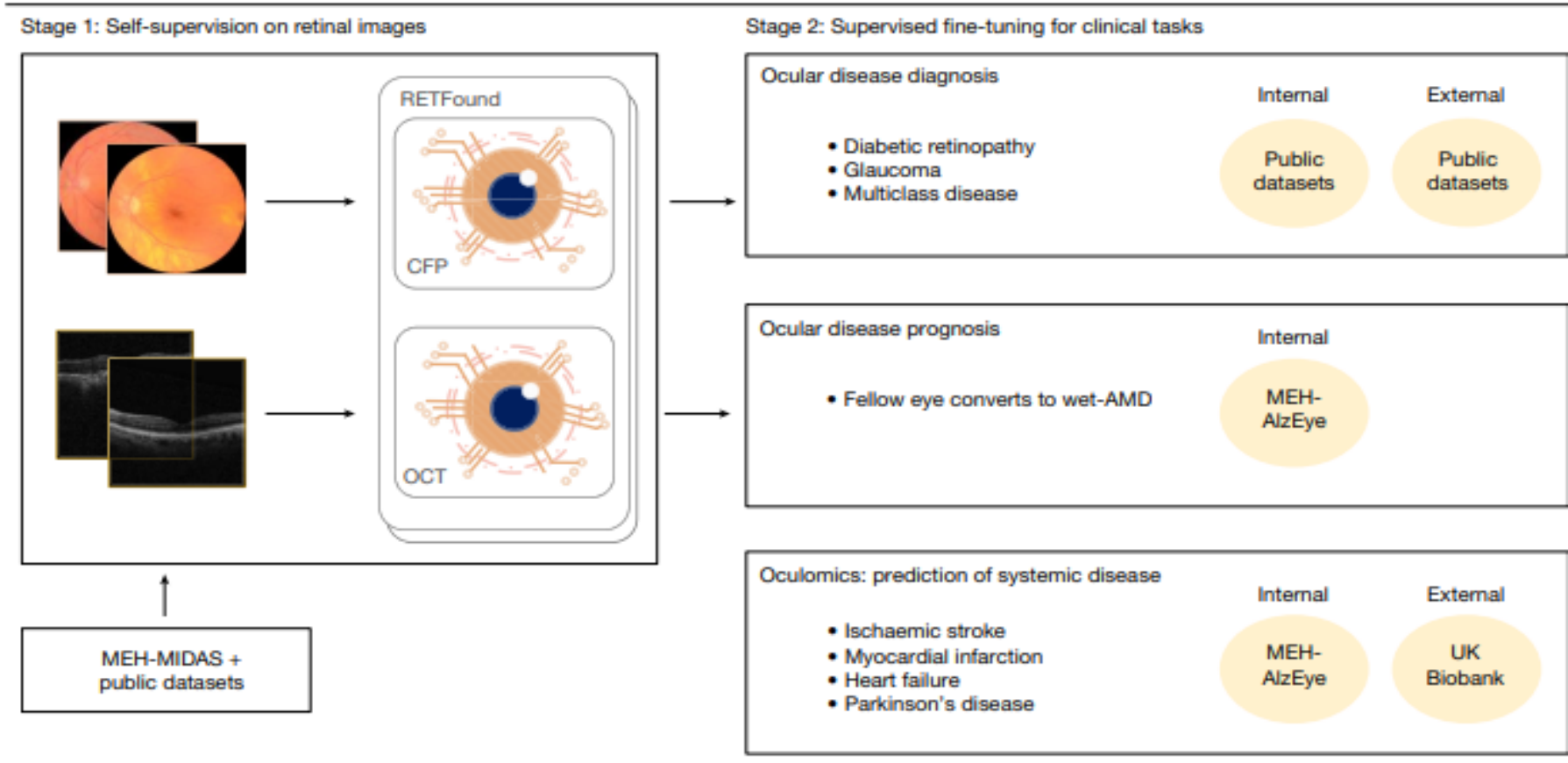
Published online: 13 September 2023

Open access

Check for updates

Yukun Zhou[1,2,3], Mark A. Chia[2,4], Siegfried K. Wagner[2,4], Murat S. Ayhan[1,2,4], Dominic J. Williamson[1,2,4], Robbert R. Struyven[1,2,4], Timing Liu[2], Moucheng Xu[1,3], Mateo G. Lozano[2,5], Pete Consortium*, Andre Alt Daniel C. Alexander[1,12] &

Medical artificial intel conditions in retinal i disorders[1]. However, t and models are usuall applications[2]. Here, w learns generalizable r basis for label-efficient



And more… EyeFound and VisionFM

- EyeFound: Trained on 2.78 million images from 227 hospitals across
- 11 ophthalmic modalities,
- Even for detecting challenging rare diseases.
- Outperforms previous work RETFound

- VisionFM
- 3.4 million images from 500,000 individuals
- 12 diseases

Foundation Model - now to 'fine-tuning'

DERBARL YERRIGAN HEALTH SERVICE

npj | digital medicine

Published in partnership with Seoul National University Bundang Hospital

Article

https://doi.org/10.1038/s41746-025-01436-1

Real-world f acceptabilit photography disease risk primary care

A list of authors and their affiliations a

We aim to assess the real-world a (secondary outcomes) of an autor cardiovascular disease (CVD) risk Participants aged 45–70 years wh were recruited from two general p participants underwent retinal ima score was generated by a deep le Health Organisation (WHO) CVD r

Articles

Population impact and cost-effectiveness of artificial intelligence-based diabetic retino living with diabetes in Australia:

Wenyi Hu,[a,b] Sanil Joseph,[a,b] Rui Li,[d,e,i] Ekaterina Woods,[a,b] Jason Sun,[f] Mingwa Mingguang He,[a,b,g,h,**] and Lei Zhang[c,a,d,e,*]

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[b]Department of Surgery (Ophthalmology), The University of Melbourne
[c]Clinical Medical Research Center, Children's Hospital of Nanjing Medical
[d]Central Clinical School, Faculty of Medicine, Monash University, Melbou
[e]Artificial Intelligence and Modelling in Epidemiology Program, Melbour Australia
[f]Eyetelligence Pty Ltd., Melbourne, Australia
[g]School of Optometry, The Hong Kong Polytechnic University, Hong Ko
[h]Research Centre for SHARP Vision, The Hong Kong Polytechnic Univers
[i]China-Australia Joint Research Center for Infectious Diseases, School of F Xi'an, Shaanxi, 710061, PR China

Summary

Background We aimed to evaluate the cost-effectiveness of an (DR) screening system in the primary care setting for both diabetes in Australia.

Methods We performed a cost-effectiveness analysis between analytic Markov model was constructed to simulate DR progr and 65,160 Indigenous Australians living with diabetes a

Tseng *et al. BMC Medicine* (2023) 21:28
https://doi.org/10.1186/s12916-022-02684-8

BMC Medicine

RESEARCH ARTICLE Open Access

Validation of a deep-learning-based retinal biomarker (Reti-CVD) in the prediction of cardiovascular disease: data from UK Biobank

Rachel Marjorie Wei Wen Tseng[1,2†], Tyler Hyungtaek Rim[1,3,4*†], Eduard Shantsila[5], Joseph K. Yi[6], Sungha Park[7], Sung Soo Kim[8], Chan Joo Lee[7], Sahil Thakur[1], Simon Nusinovici[1,3], Qingsheng Peng[1,9], Hyeonmin Kim[4], Geunyoung Lee[4], Marco Yu[1,3], Yih-Chung Tham[1,3,10,11], Ameet Bakhai[12,13], Paul Leeson[14], Gregory Y.H. Lip[15], Tien Yin Wong[1,16] and Ching-Yu Cheng[1,3,10,11]

Abstract

Background Currently in the United Kingdom, cardiovascular disease (CVD) risk assessment is based on the QRISK3 score, in which 10% 10-year CVD risk indicates clinical intervention. However, this benchmark has limited efficacy in clinical practice and the need for a more simple, non-invasive risk stratification tool is necessary. Retinal photography is becoming increasingly acceptable as a non-invasive imaging tool for CVD. Previously, we developed a novel CVD

The Economist

Modi's secret weapon

Corpulent consultancies

Trump and the world

Antarctica loses its brrrr

MARCH 30TH-APRIL 5TH 2024

The AI doctor will see you …eventually

Is AI for DR diagnosis any use for you?