

IDxDR Infographic

Module Title: Digital Health and Technology

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What is it?

IDx-DR was the first autonomous AI to receive FDA approval as a technology that can provide **diabetic retinopathy** (and macular edema) diagnoses for **people living with diabetes**. (Abràmoff *et al.*, 2018).

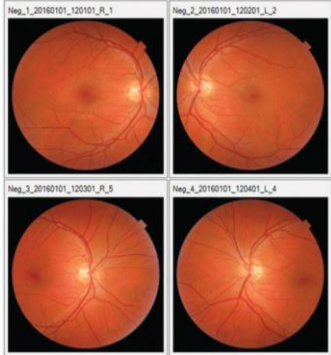


Figure 1: Fundus image needed for diabetic retinopathy screening using IDx-DR (IDx Technologies, 2021)

- 1 Using a fundus camera, two 45° **colour fundus photographs** per eye, one optic disc and one macula centered
- 2 The images are submitted to cloud-based IDx-DR servers
- 3 IDx-DR analyses images for signs of diabetic retinopathy, providing results in less than a minute (Grzybowski and Brona, 2021)

How it works

Detect diabetic retinopathy

- Referable diabetic retinopathy
 - Moderate diabetic retinopathy
 - Vision-threatening diabetic retinopathy
- Refer to an eye care professional

The Technology

Development: developed on training dataset called the Messidor-2 that have been evaluated by ophthalmologists to detect:

- Normal anatomy: optic disc & fovea,
 - Lesions characteristic of diabetic retinopathy: haemorrhages, exudates & neovascularizations.
- 10,000-1,250,000 unique samples used depending on the lesion from patients with diabetic retinopathy to develop **convolutional neural networks*** for retinal fundus images

(Quelleg *et al.*, 2011; Indolia *et al.*, 2018)



Deployment: the deployed technology works with two algorithms:

- **Image quality assessment** – immediately verifies image quality to indicate if image should be retaken
- **Deep learning algorithm** – determines if diabetic retinopathy is present and subsequent sorting by severity based on predetermined thresholds

(Heijden *et al.*, 2017)



*deep learning algorithm that can detect complex features or patterns in an image at different resolutions based on training images

Data Ethics

The cybersecurity considerations of data privacy, integrity, availability and malware are safeguarded using platform, application and procedure controls (FDA, 2018). As such, sensitive health information including retinal images and diagnostic reports comply with GDPR laws.



(Abràmoff *et al.*, 2021)

Access and Inequalities



Minimize **geographical** inequalities – targeting areas with health disparities → currently operates in 17 countries



Minimal operator training for primary care practices that have the appropriate camera and established screening initiatives → easily fits in the **workflow** requiring minimal operator training



Algorithmic bias risk mitigated – diverse training dataset regarding sex, race, ethnicity, lens status and metabolic control



Dependence on internet connection and Topcon NW400 **limits integration** and accessibility and can pose as a financial barrier for certain healthcare providers.

(Abràmoff *et al.*, 2018, Leonard, 2020, Ursin *et al.*, 2021)



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Figure 2: IDx-DR on Topcon NW400 (IDx Technologies, 2021)

