Role of the Brien Holden Vision Institute in Diabetic Eye Disease Management

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Declaration: Brien Holden Vision Institute has commercial interests in the retinal camera

The Challenge: Closing the Gap

Diabetes - Rate of Blindness

14x higher from diabetes
Why Create a New Retinal Camera

• Most people in the world who need retinal imaging don’t get it

• Not generally available
  – Cost
  – Specialized training and experience to take images
  – Lack of expertise to diagnose

• **Goal:** Create an easy to use retinal camera with images equivalent to the best at a very affordable price. Make imaging the retina a part of every eye exam.
The Ideal System

**Will:**
- be widely available and accessible
- have instrumentation that is:
  - automatic
  - portable
  - rugged
  - cost-effective

**And Will:**
- produce high quality images
- provide accurate recording, analysis & assessment
- guidance on-site and to the expert (remotely if needed)
Objective

- To develop an affordable and innovative high-resolution retinal camera that acquires multispectral images (MSI) of the retina, coupled with a custom image analysis (ImA) algorithm and artificial intelligence (AI).

- This will provide automated, same-visit detection and interpretation of retinal images that can be used by health care workers in regional/remote communities and professionals at all levels of the health system.
Retinal Camera
Camera Overview

Product features include:

• Auto-focus, point/click/drag tablet software that allows for easy aiming of camera, auto-capture of images, 2D and 3D image analysis.

• Uses custom software and unique optics to produce high resolution, high quality digital images to provide diagnosticians with details of the retina that are useful in detecting, at an early stage, a wide range of pathologies.

• Takes images in stereo, allowing clinicians to see the shape and depth of features on the retina, particularly useful for tracking changes over time for glaucoma or tumors.
• Takes images in three wavelengths: green (550), red (650) and infra-red (850). Green enhances the visibility of features on the surface of the retina (blood vessels and hemorrhages). Infra-red makes visible features below the surface of the retina, (choroid layer). Red, in combination with green, provides images in color.

• Captures a set of images each with a 20° field of view. A 20° field of view assures consistent high resolution of image across the full 20° degree field of view.

• Uses stitching software to build image mosaics: Camera has capability of taking up to 7 stereo images of each eye. When these 7 images are stitched together, the result is a 55mosaic presents a high-resolution 55° field of view.

• 24" high by 18" wide by 24" deep. The camera will weigh approximately 26 pounds.
• Tele-medicine: The camera will be able to send images via the Internet by email or via Remote Desktop access when connected via a router to a computer that has Internet connectivity. Brian Holden Vision will supply "readers workstation software" to manage photos on a computer with a Windows 7 or later Windows operating system.

• Initial Languages – English, Spanish, French, German, Italian, Portuguese, Chinese

• Many future capabilities – software only upgrades

• Very affordable
Unique HQ Multi-Spectral Imaging Camera

Conventional Camera

Composite Colour Image

Confounding of colour information limits image analysis options

Multi Spectral Images & HiRes Camera reveal detailed features unobtainable with colour cameras

Multispectral Imaging Camera

Green Image

Infra-Red Image

Red Image
Representative 20° FOV image
We have Image Analysis for Feature Extraction

- Current image analysis software applied to a conventional RGB retinal camera image
  - vascular branches
  - optic disc
  - macular
  - exudates
  - haemorrhages

- What we need is Automated algorithm feature analysis with High Res images
The Solution

- Automatic: can be used by non-expert operators
- Accurate (sensitivity/specificity)
- Fit for environment, fit for purpose
- Same-visit recommendation

- Provide detailed HQ MS and stereoscopic images and analysis for the Expert to review and manage the patient either on-site or remotely
- By 2015, System for detection, interpretation and ‘diagnosis’ of diabetic retinopathy and glaucoma
- By 2015, risk assessment software
- Beyond 2015 – other conditions detected
Commercialization Strategy

- India, China, Australia and U.S. initial focus
- Most sales through distributors
- Market based pricing in developed market, pricing in undeveloped markets subsidized by sales in developed markets
- Additional functionality every 9-12 months
- Release auto-refractor software within 1 year, enables use of camera as an auto-refractor
Research: Retinal Camera

- India
- Mexico
- China
- Evaluate the instrument and the delivery system
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