healthintelligence

North West London DESP

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Head of Clinical Development

Introduction to HI

healthintelligence

- Information Analytics Company
- Eleven years of experience DESPs – screened >400k
- ISO Certified
- East Anglia DESP – 110,000 patients
  - 230 GP practices
  - >90% Uptake
  - 99.5% friends and family survey
- Focus on DR and Non-DR
- Own software – 'Spectra' with:
  - CAP Level 3 certified by EN DESP
  - Module for General Practice
  - Module HES

Introduction to NWL DESP

- Previous Programmes
  - Brent
  - Ealing & Hounslow
  - Hammersmith & Fulham
  - Harrow
  - Hillingdon
  - Kensington, Chelsea & Westminster
- Commissioned for
  - Screening
  - Surveillance – Digital and SLB
- Accessible Service – adding to existing 22 screening venues, early morning, evening and weekend appointments
- Current Issues Observed:
  - Capacity,
  - Quality of photography,
  - Quality of grading,
  - Inappropriate unassessable rates regime,
  - Screening incidents (wasting time and focus)

Introduction to NWL DESP

- New Management Structure
- Extensive Clinical Lead Team – Miss Sheena George
- Programme Office – Perivale
- New Grading Environment
- Invested in all new equipment - new Canon CR2
- New Internal Quality Assurance & Assessment Regime
- Introducing new Grader Feedback focusing on “Self Teaching and ‘Self Awareness’
- Spectra is excellent, but can be further improved with your input
- Consent for Research and Training
- New Web Site to keep Patients/Carers and Healthcare Professionals informed. www.nwldesp.co.uk

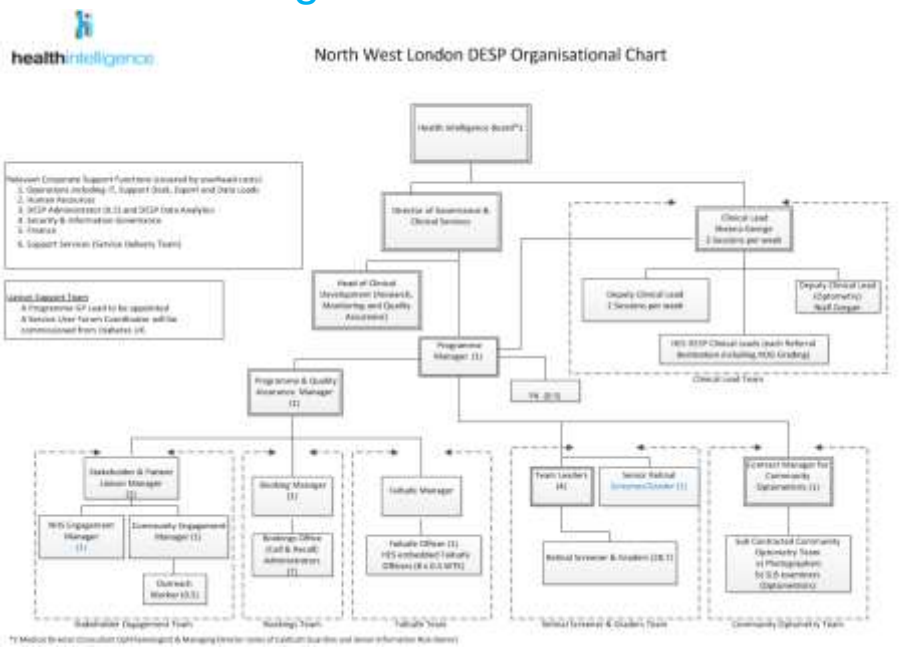
New NWL DESP Website

User Name: “Healthcare” Password: “eyescreening”

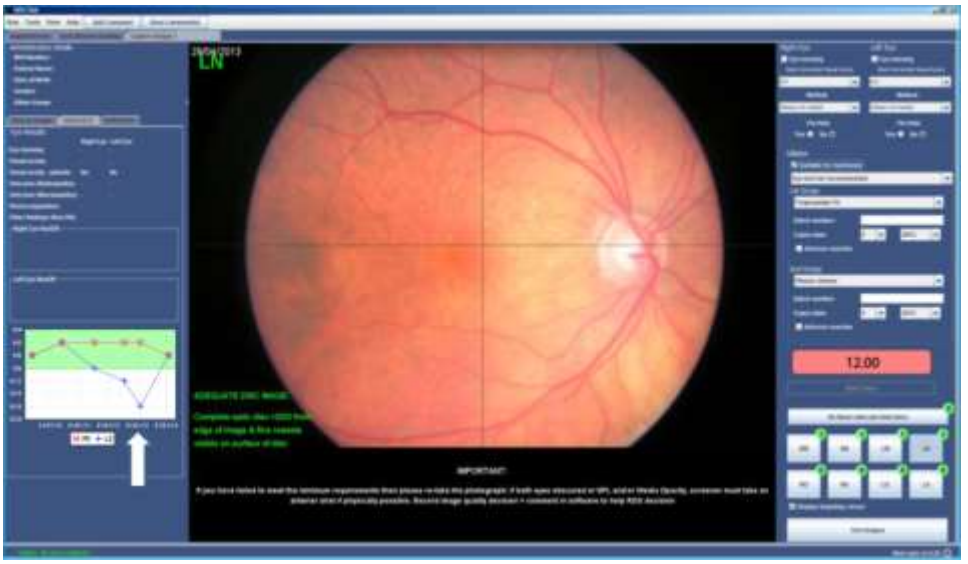
Universal Issues with DESPs

General Practice	Gap	Screening Programme	Gap	HES
	Solutions Electronic Referral to programme		Solutions Electronic Referral to HES - Referral Dashboard - HES Discharge - HES Feedback Funded support for HES Clinical Lead input Funded HES Embedded Failsafe Officers	

Organisational Chart



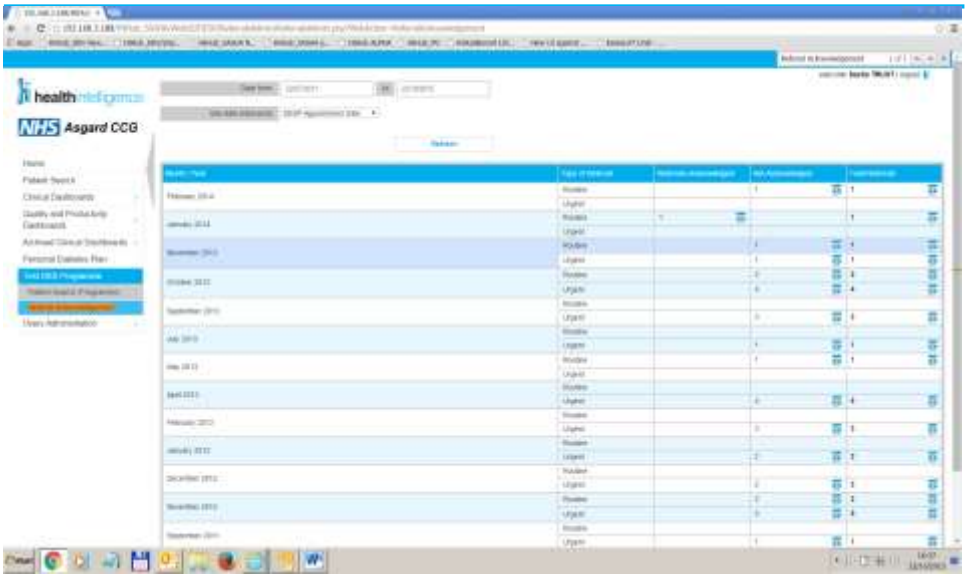
Spectra for Photography



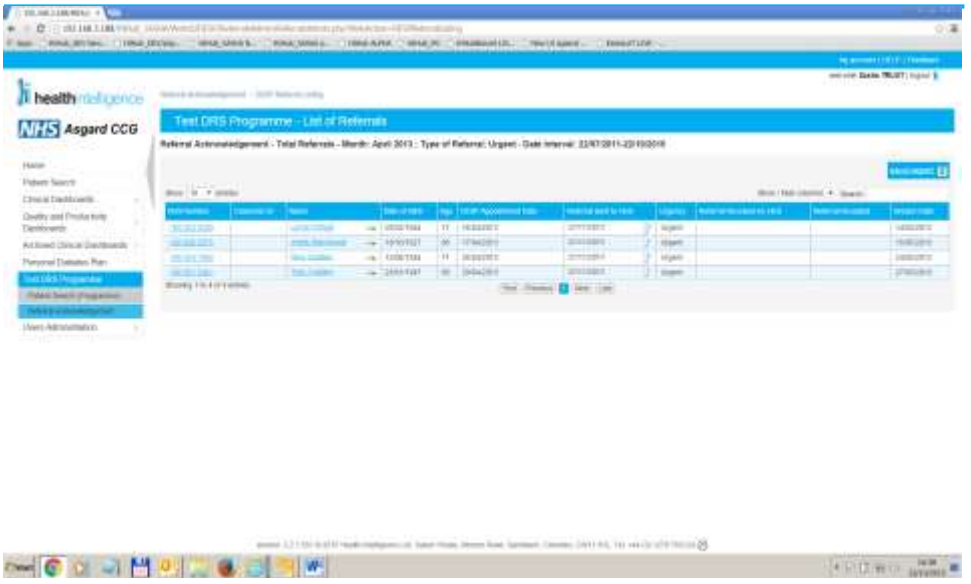
Spectra for Grading

HES Login screen

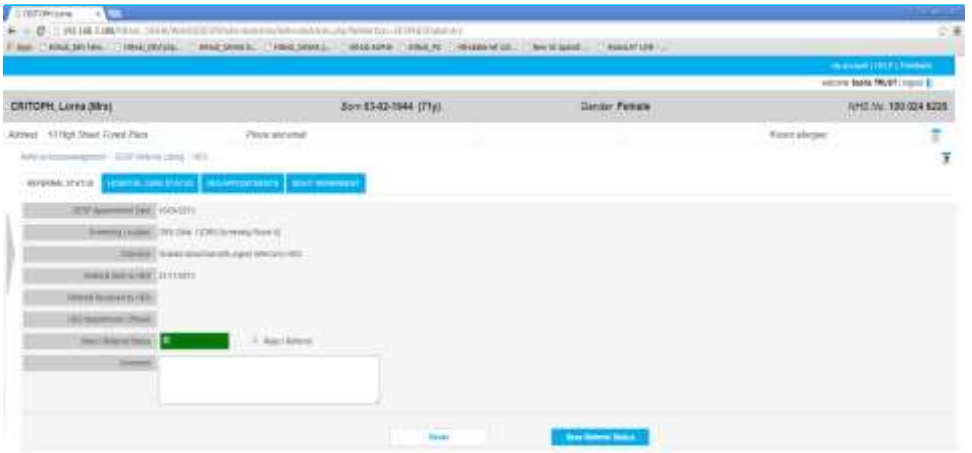
Referral Acknowledgement



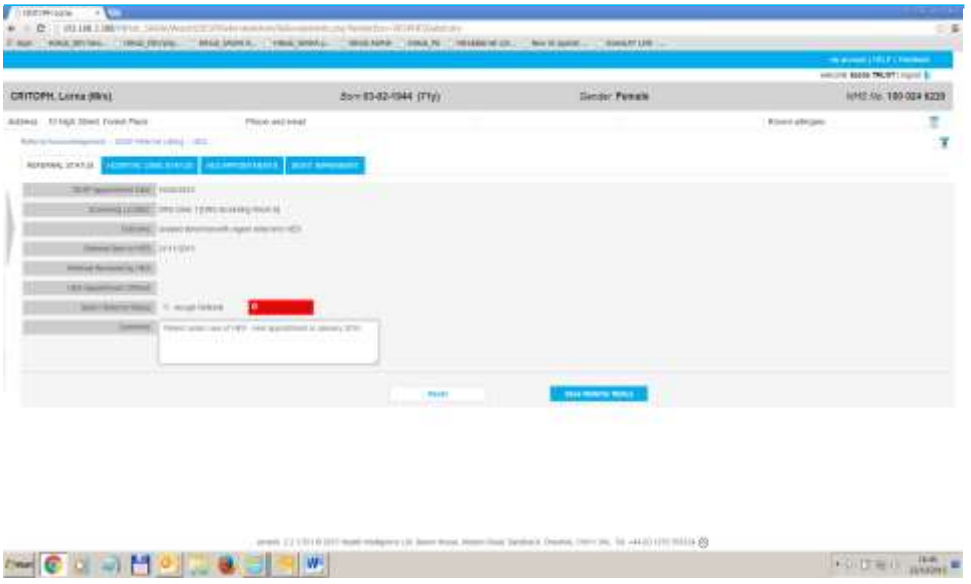
Referral Listing



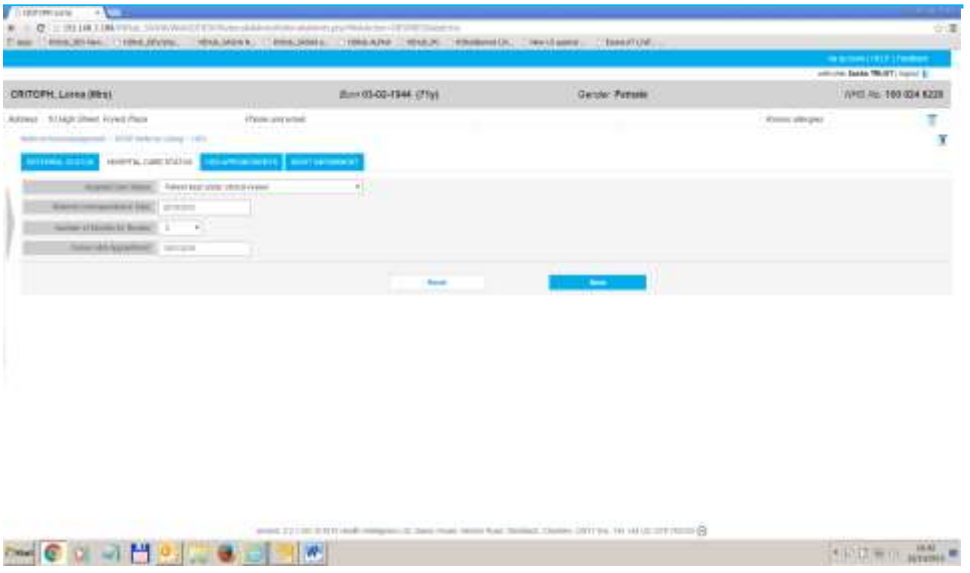
HES Data Entry screen
Referral status



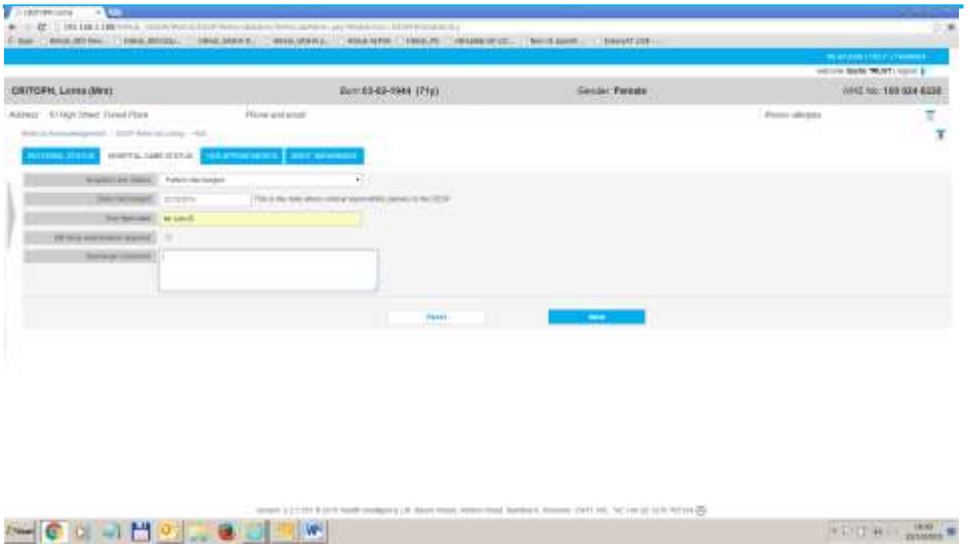
HES Data Entry screen
Referral status



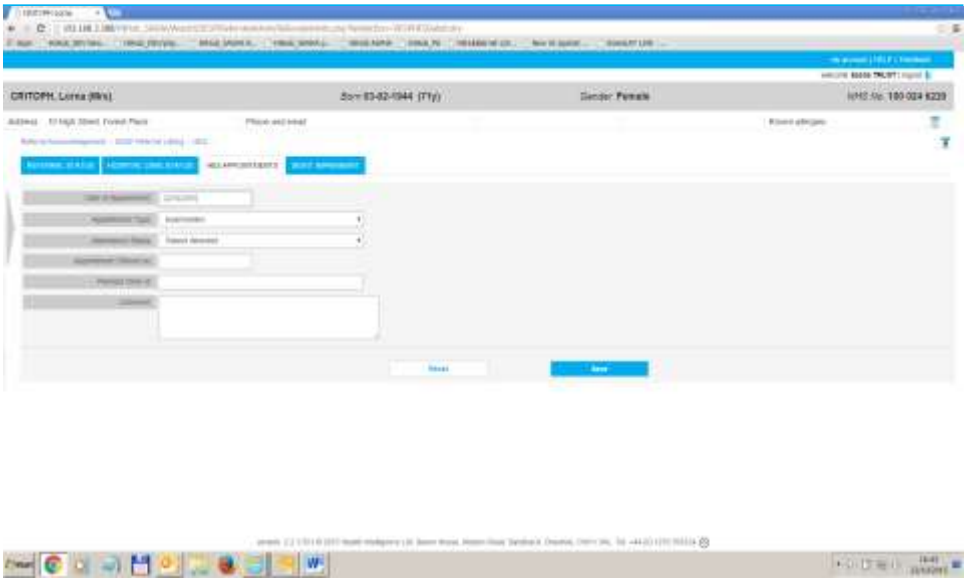
Hospital Care Status –
Kept under clinical review



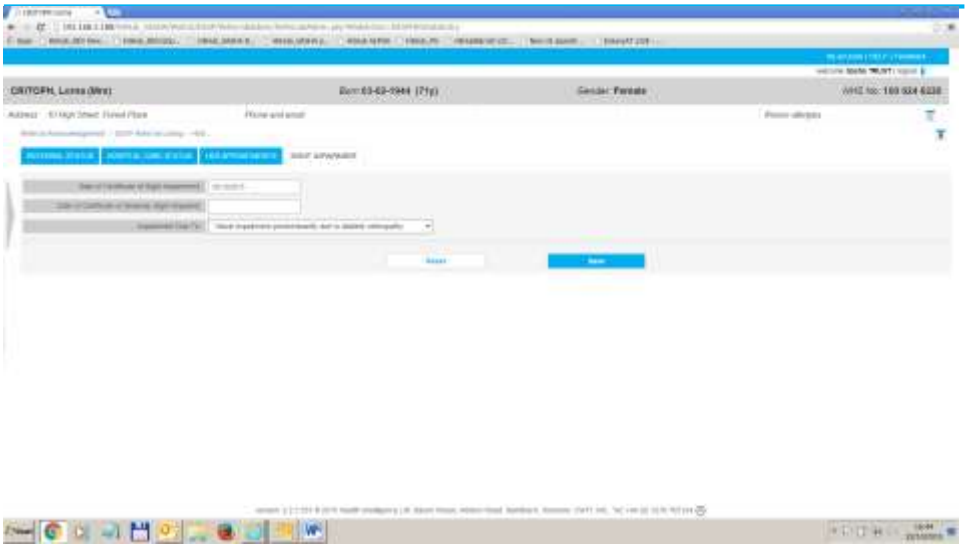
Hospital Care Status – Patient being Discharged



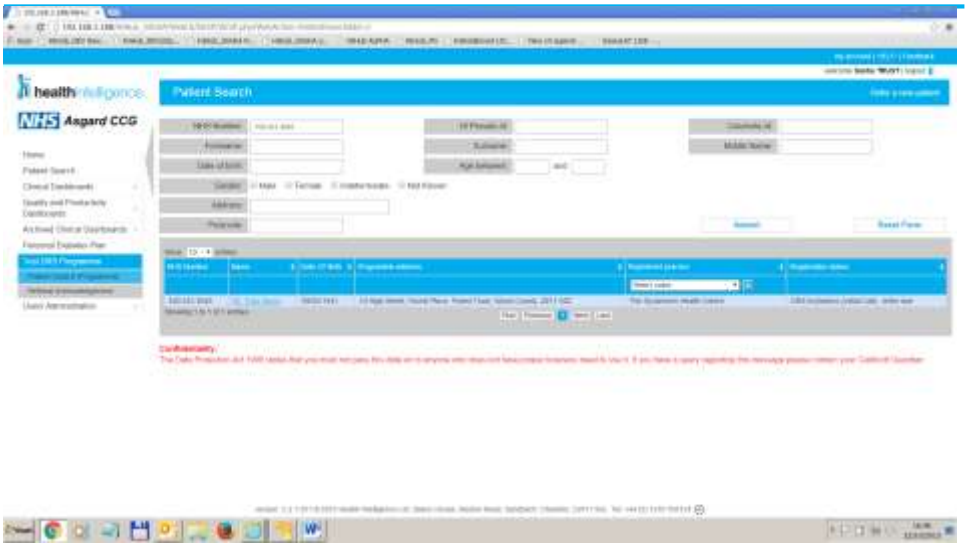
HES Data Entry screen HES Appointments



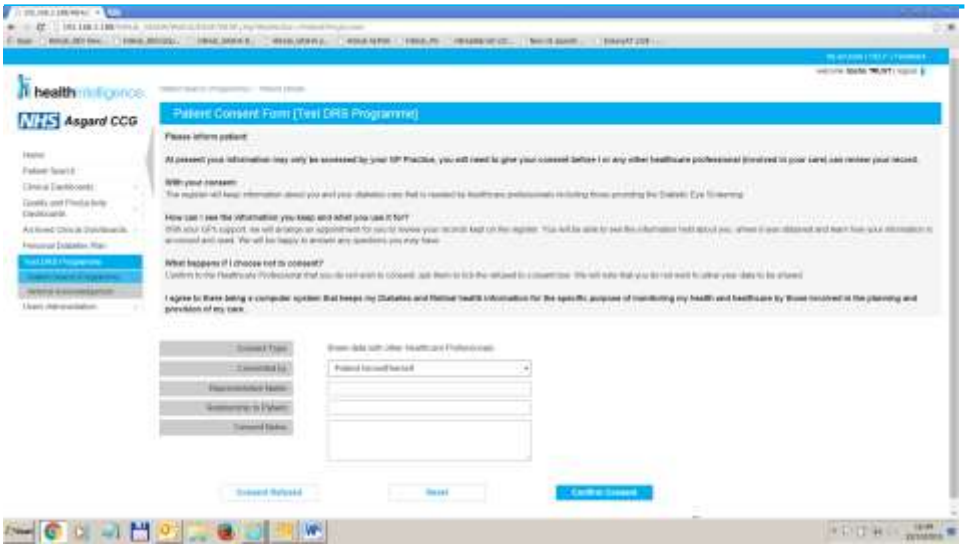
HES Data Entry screen Sight Impairment



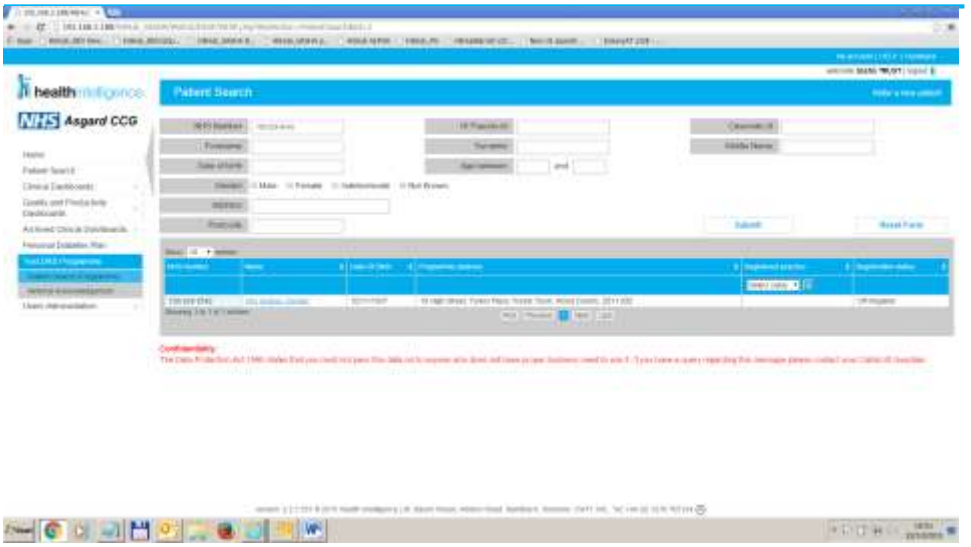
Patient Search



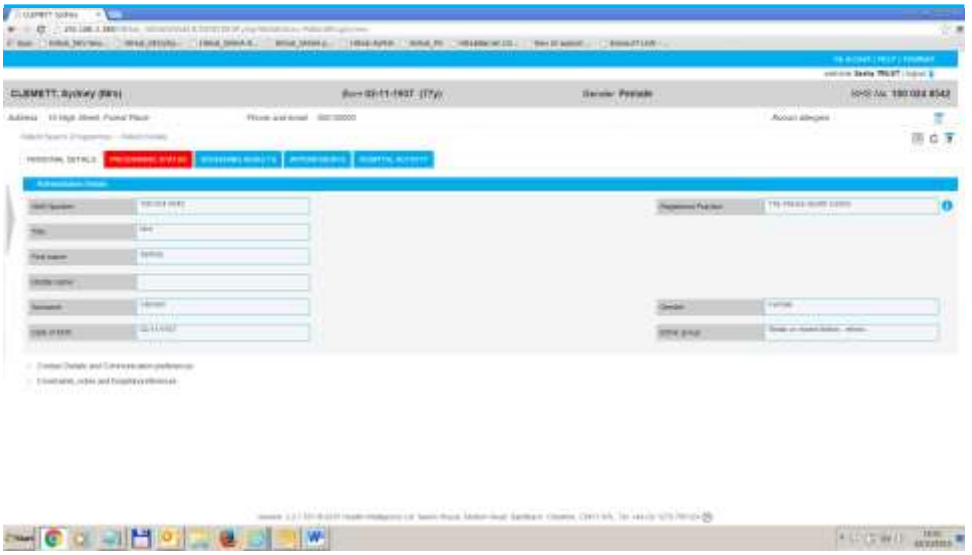
Patient Consent Form



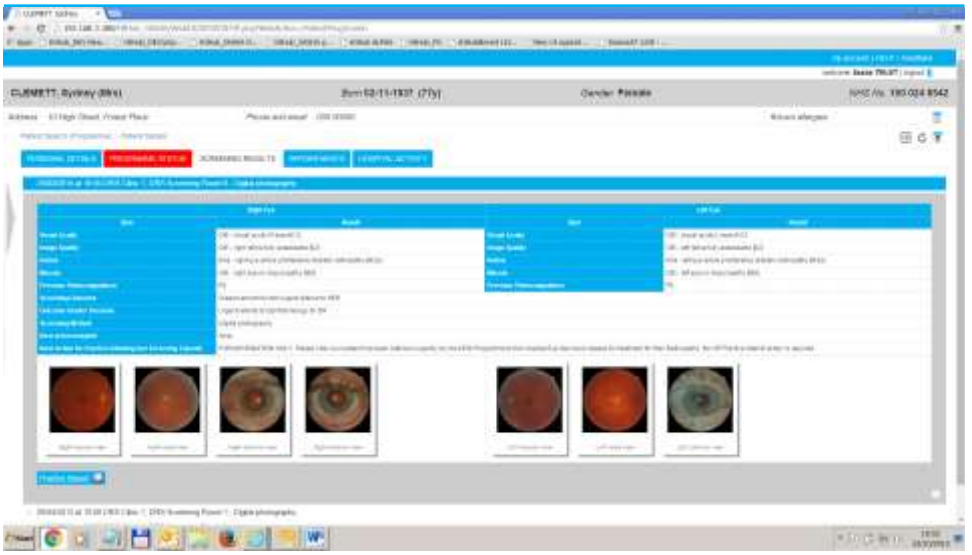
Patient Search



DESP Patient Screen



DESP Patient Screen



Referral review manipulation

NWL DESP –best in the world

- It could be with your support!
- There are issues and will be over the first few months
- We will investing in making the NWL DESP the best in the world
- Research prompted – recent publication, and several papers being finalised
- We will support Clinicians

Thank You

Conditions we look for

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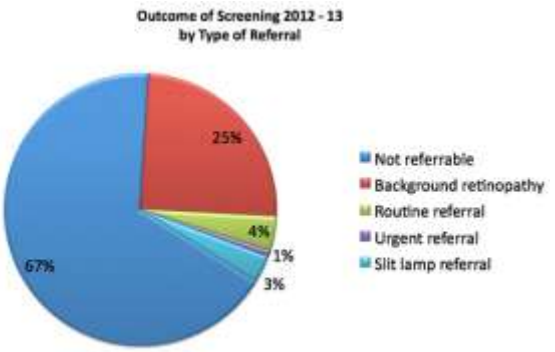
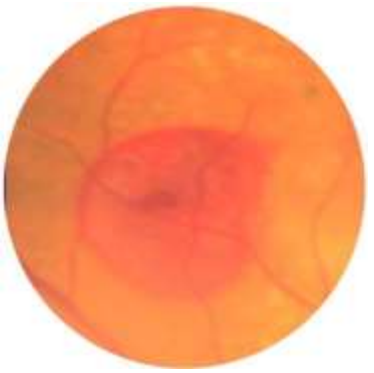


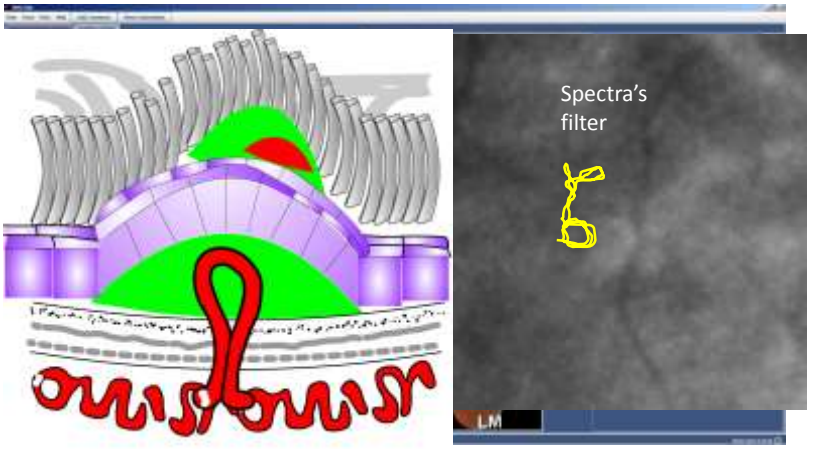
Diabetic retinopathy

Conditions we look for



Wet AMD

Conditions we look for

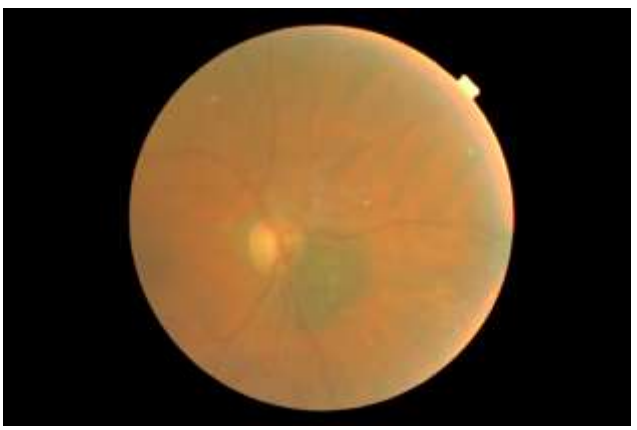


Wet AMD

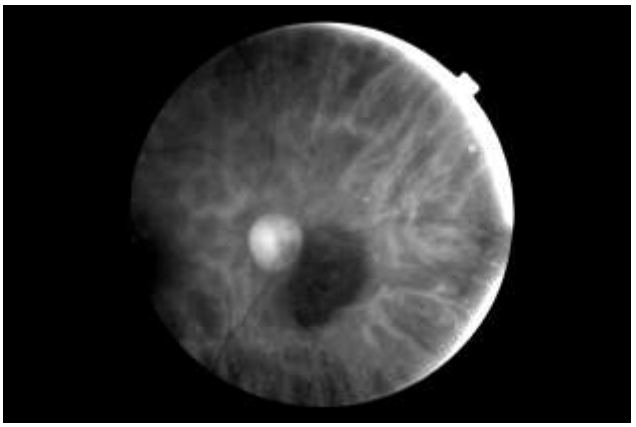
Conditions we look for

Disc swelling / CHERPE

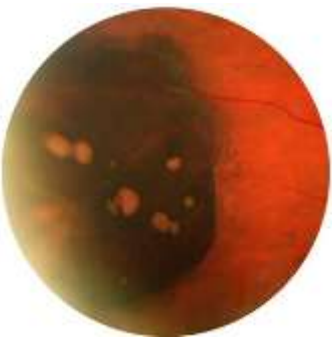
Conditions we look for



Conditions we look for

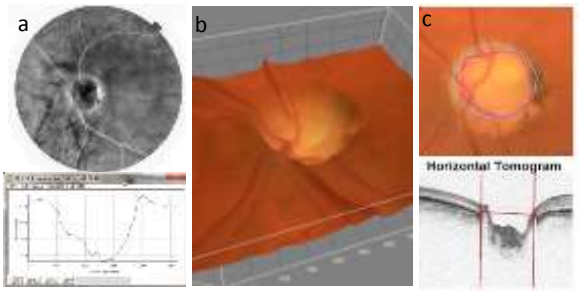


Conditions we look for



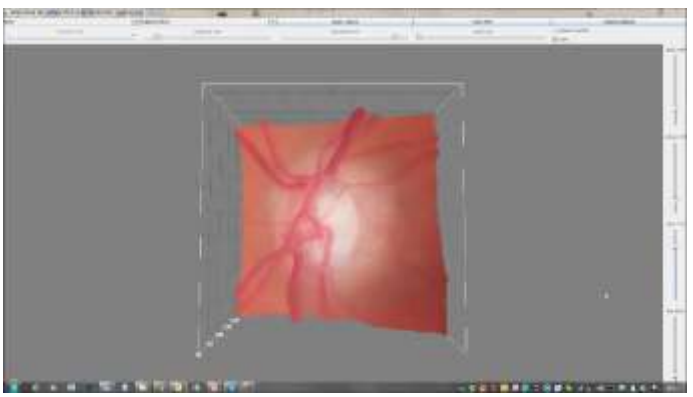
CHERPE / Disc swelling

Conditions we look for



Glaucomatous changes

Conditions we look for



Glaucomatous changes

Conditions we look for

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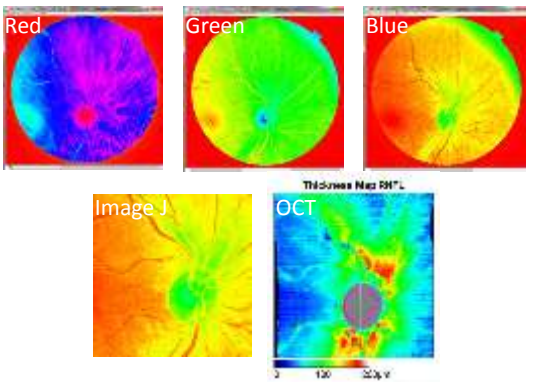
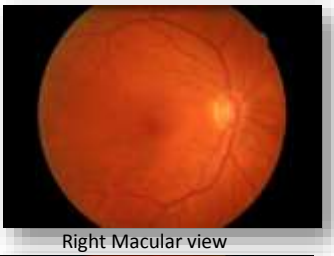


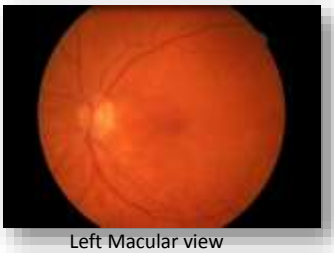
Glaucomatous changes

Ensuring good standards

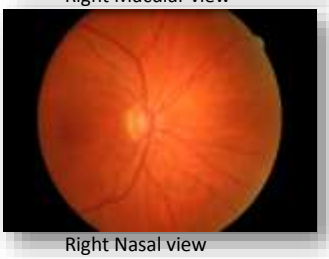
These are examples of the four main retinal images we take of the patient's eyes during screening



Right Macular view



Left Macular view



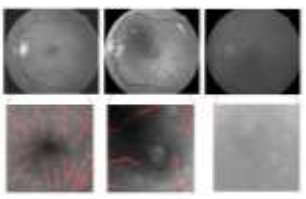
Right Nasal view

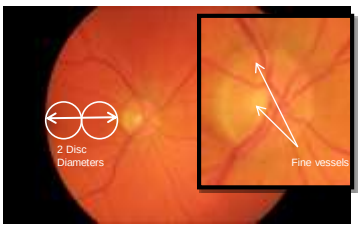
Left Nasal view

Ensuring good standards

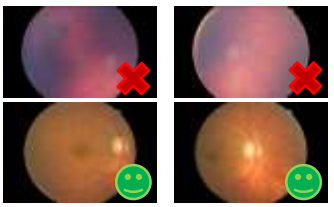
Adequate Macular image

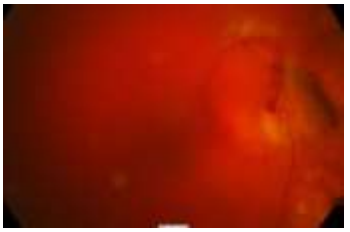
centre of fovea >2DD from edge of image
& vessels visible within 1DD of centre of fovea





However, if sight threatening conditions are present on any image, the eye should be graded as adequate and patient referred to HES.



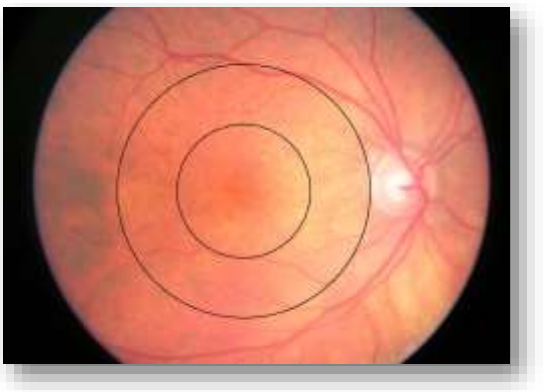


Ensuring good standards

Ensuring good standards

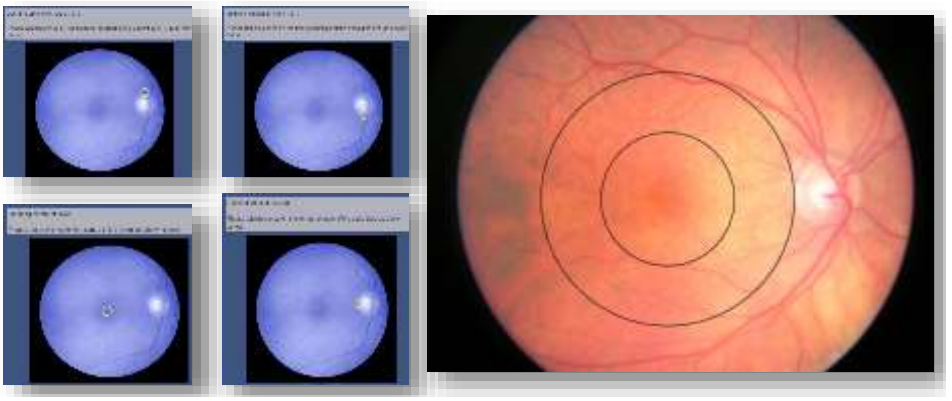
The Measurement Tool

The Measurement Tool is designed to allow graders to visually compare distance based on the diameter of the optic disc. The tool will display two circles centred around the fovea allowing the user to accurately see artefacts within 1 disc diameter of the fovea and artefacts in the macular.



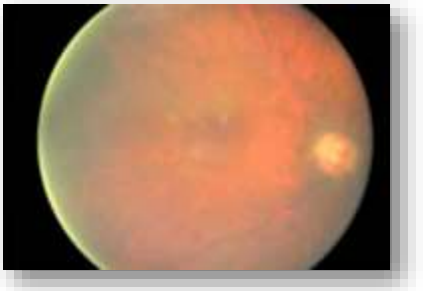
Ensuring good standards

To enable the Measurement tool the discs diameter is measured, to do this the user simply clicks on the top edge of the optic disc, then the bottom edge, the centre of the fovea and finally select the edge of the optic disc facing the fovea. This then draws a perfect macular target enabling clear visualisation of the macular for grading purposes

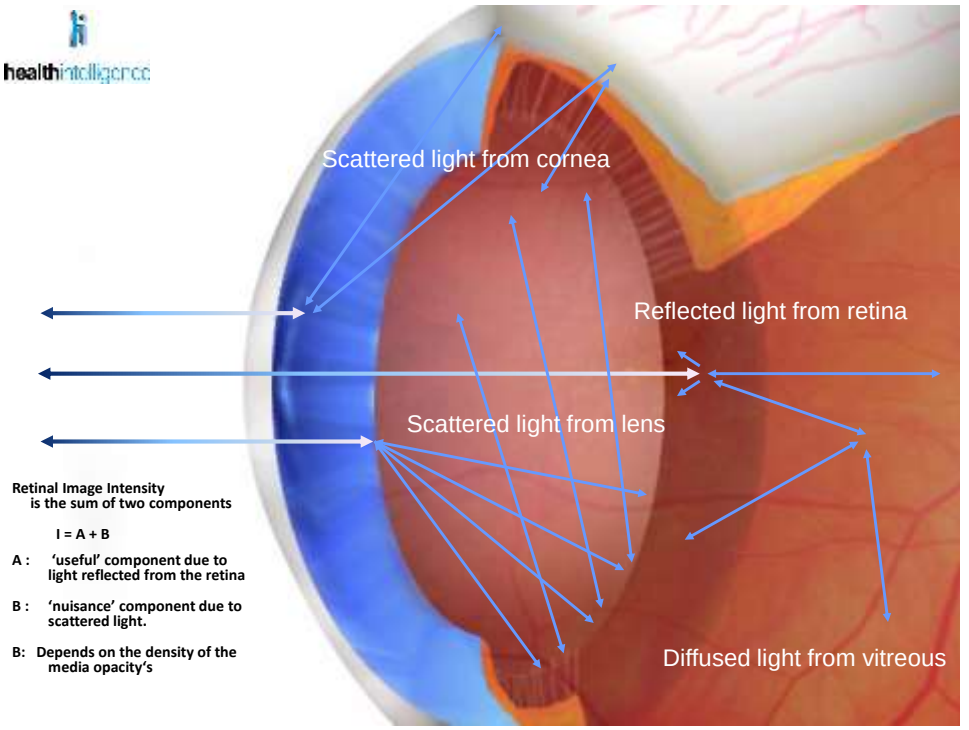


Further research

Unassessable images



- There are several reasons why a patient may get an unassessable result from the screening examination
- One example is that the lens of the eye can get too cloudy to see the back of the eye; this may be because of a cataract



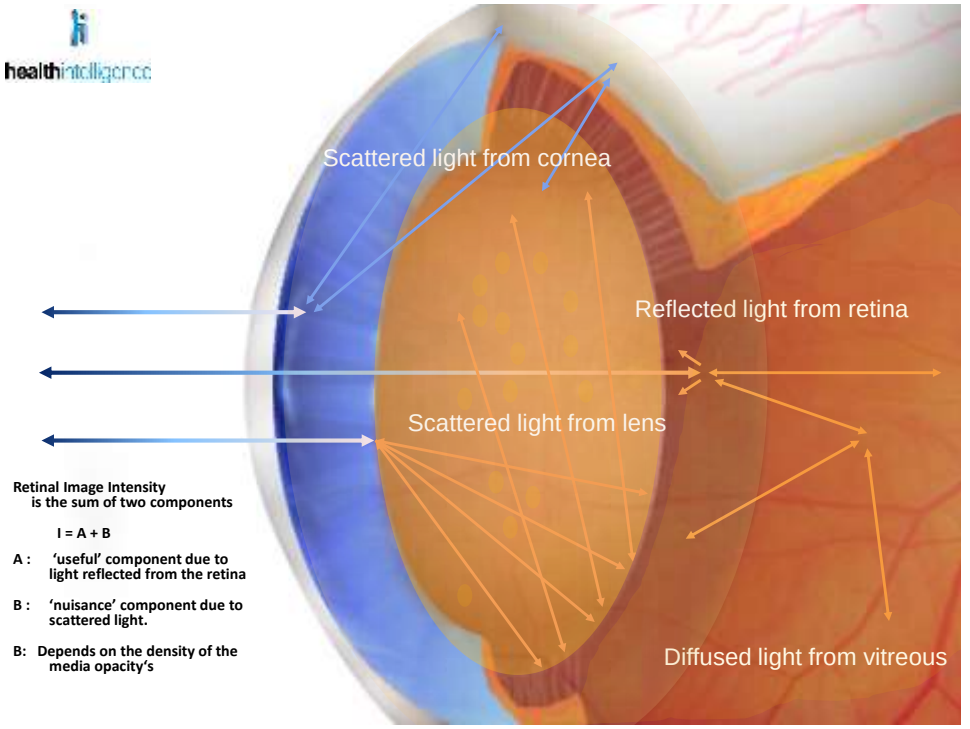
Retinal Image Intensity is the sum of two components

I = A + B

A : 'useful' component due to light reflected from the retina

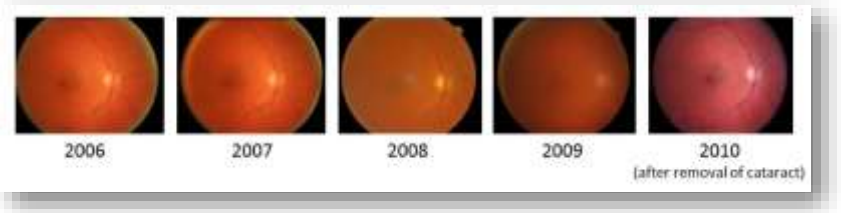
B : 'nuisance' component due to scattered light.

B: Depends on the density of the media opacity's

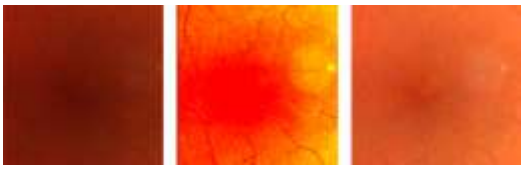


Unassessable images

- To overcome this we have utilized a patented filter which enhances retinal images without loosing image quality, this filter is called Clearvue.
- This filter reduces unassessable rates by 11%
- Below is an example of a cataract developing.



Unassessable images



Drusen looking like exudate after manipulation

IRMA looking like NVE after image manipulation

Unassessable images

Scattering effect expected to be similar to other dielectric particles such as water and the crystalline structure of a cataract forming in the lens of an eye.

Initial tests with archive video footage from Iraq and Saudi Arabia showed this algorithm process is effective in mitigating contrast loss.

Unassessable images

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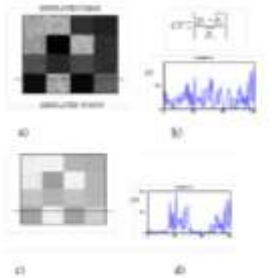

Unassessable images

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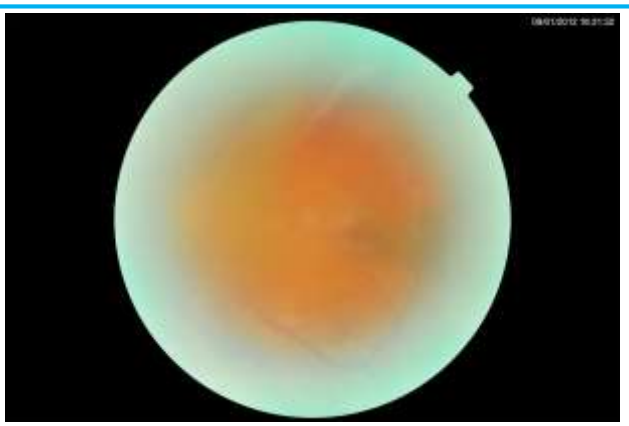

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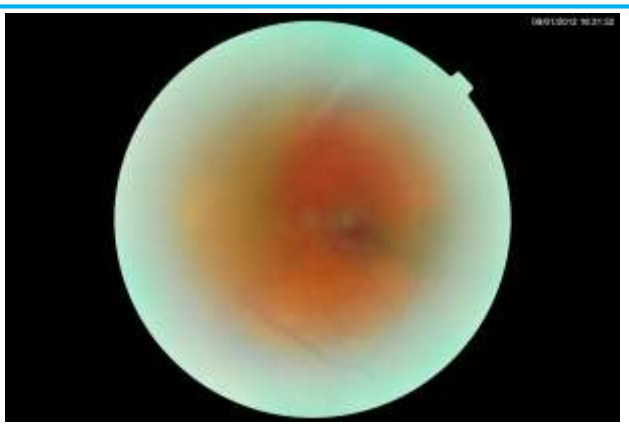

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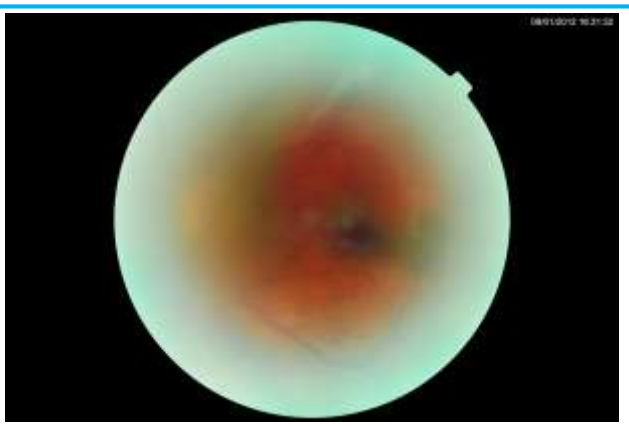

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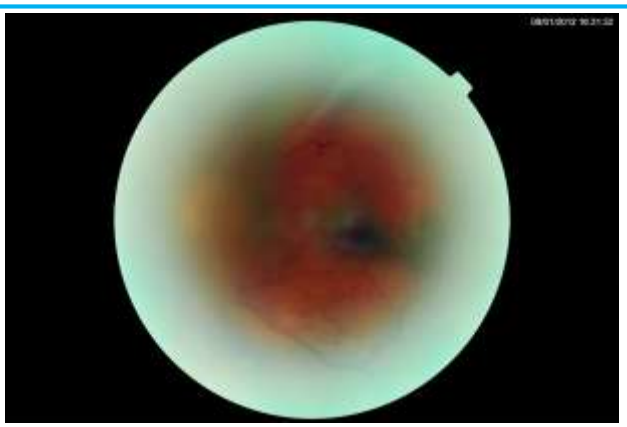

Unassessable images

Original unassessable image

Unassessable images

Unassessable images

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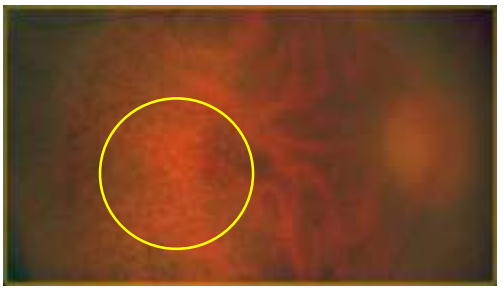
Unassessable images

Original unassessable image

Unassessable images



Understanding images

- Microaneurysms (present in 7.3% of the population) seem weakly predictive across all age groups.
- While blot hemorrhages (present in only 1.4% of the population) may be associated with a two to four times increased risk of developing diabetic retinopathy, especially in persons 65 years old or younger.
- How do we know if we have seen a 'real' Microaneurysms?

Understanding images

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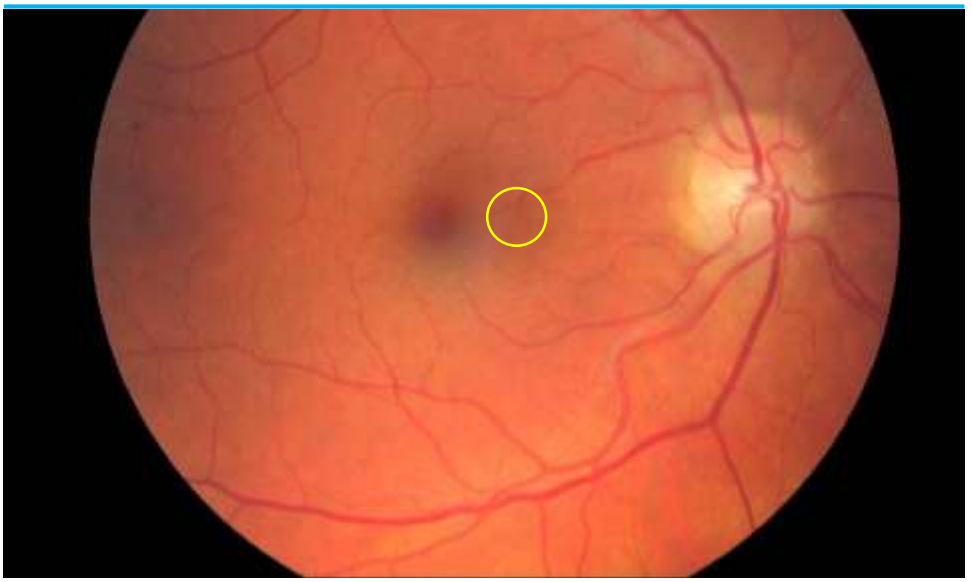

Understanding images

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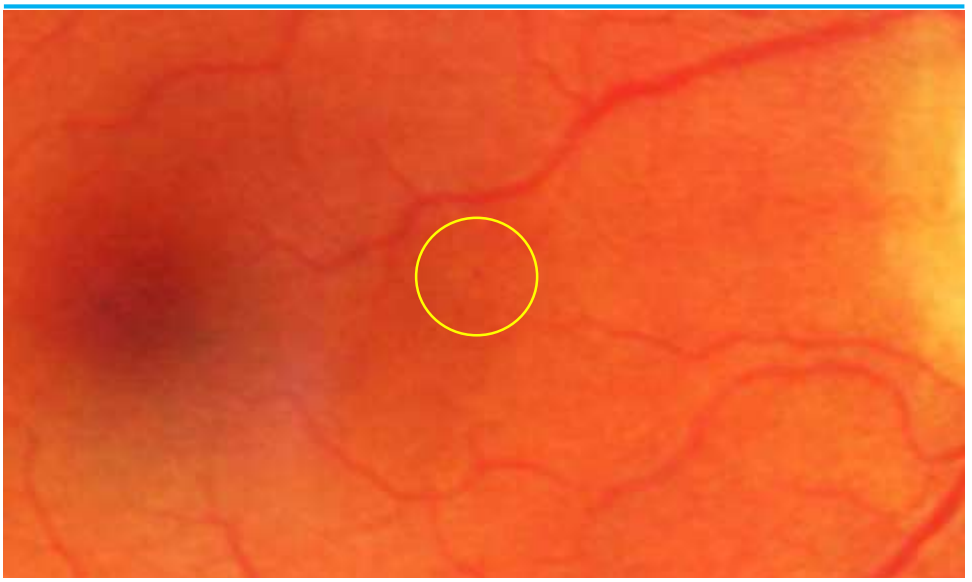

Understanding images

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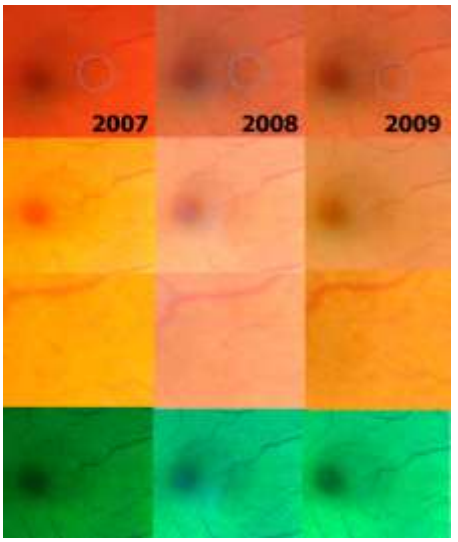

Understanding images

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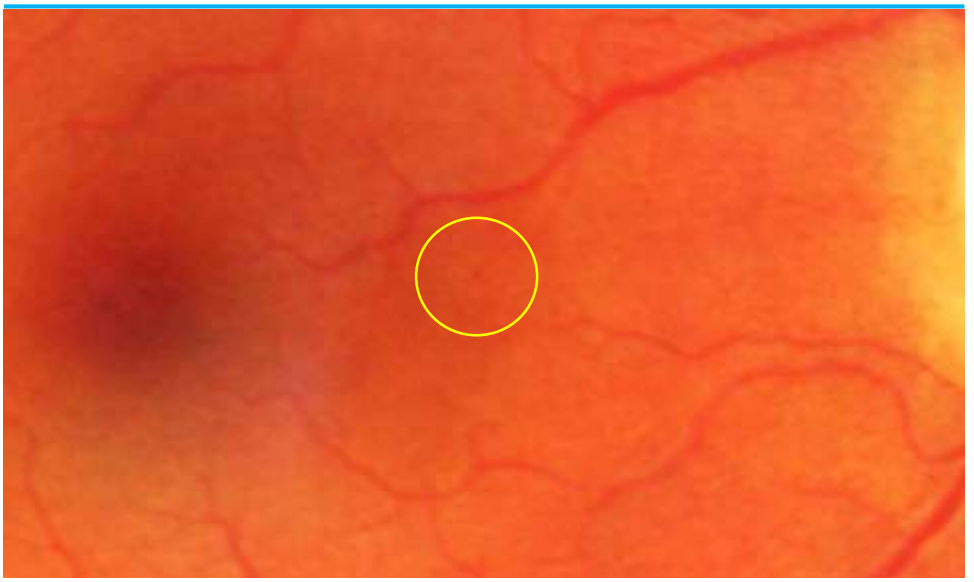
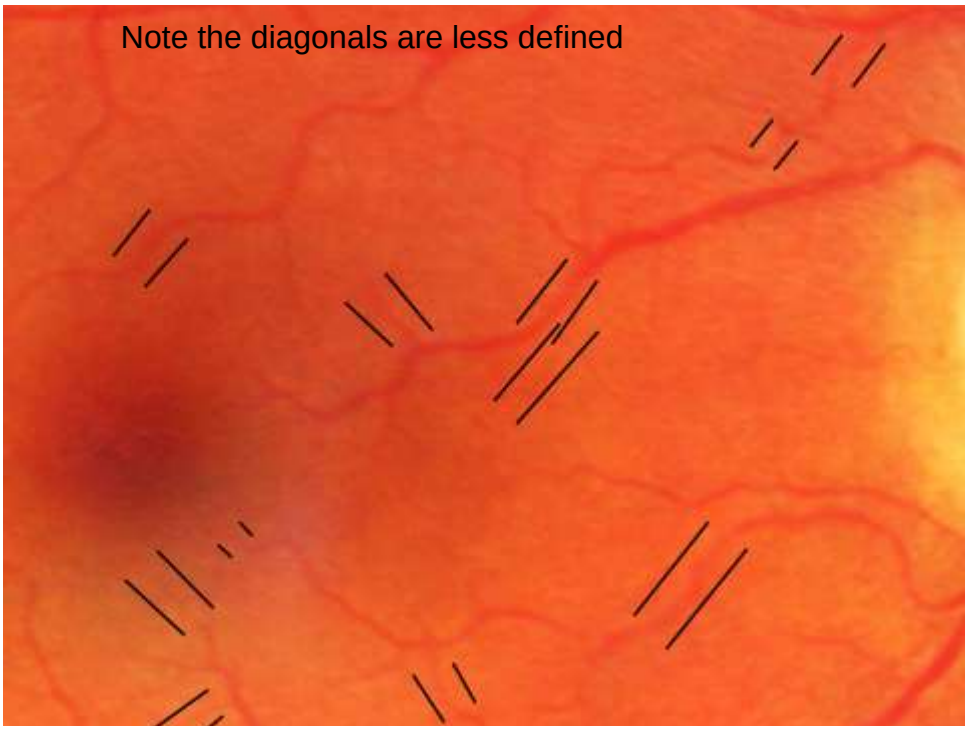
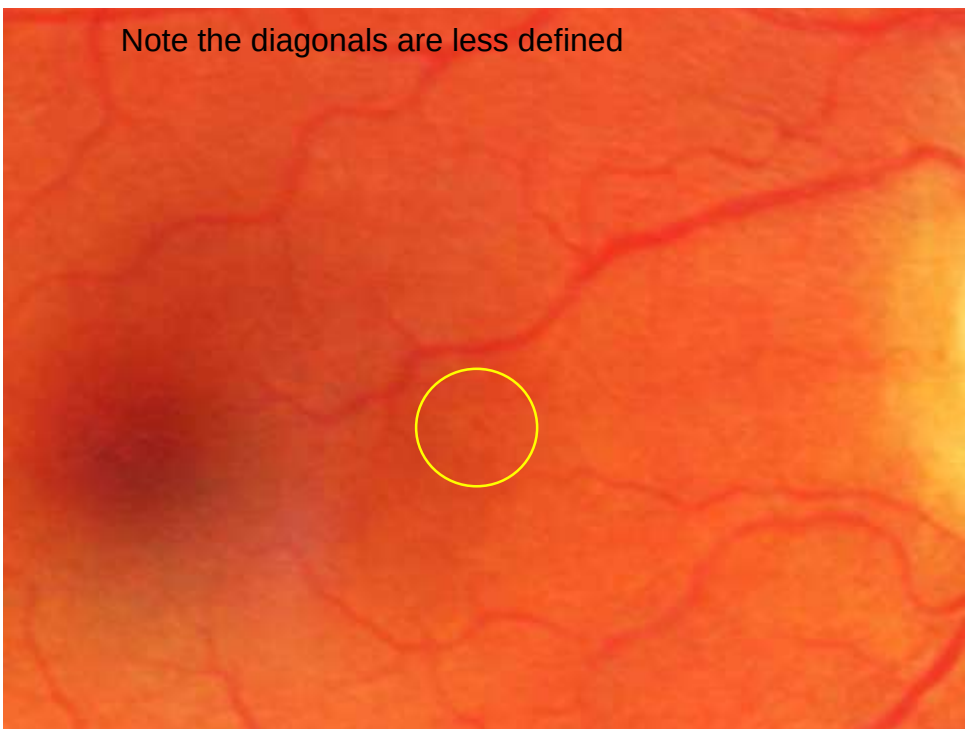
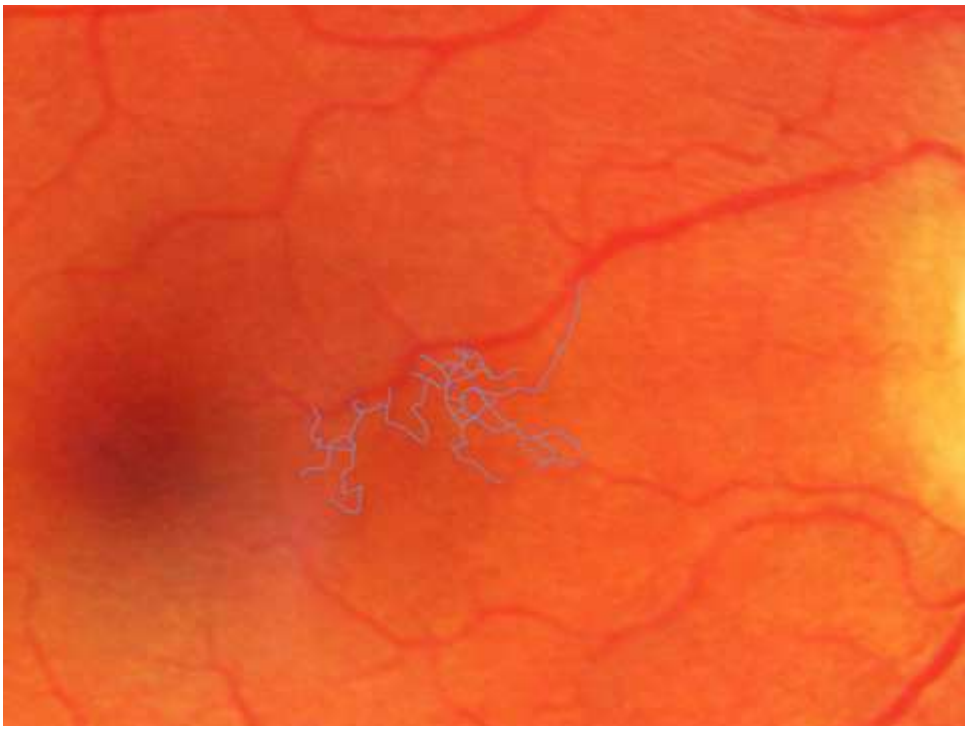
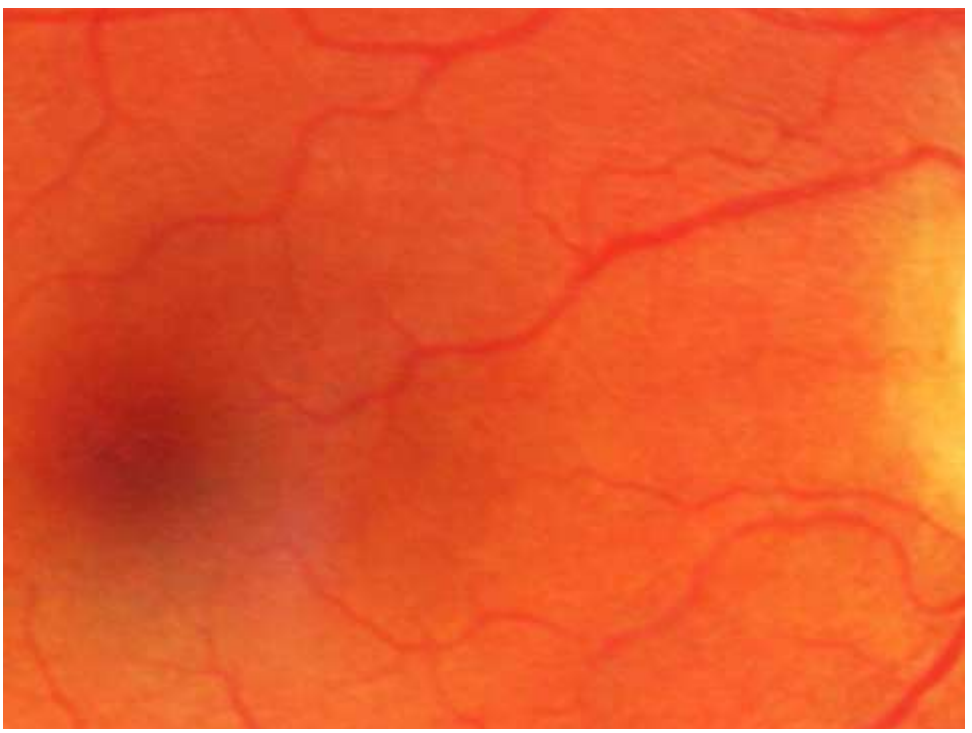
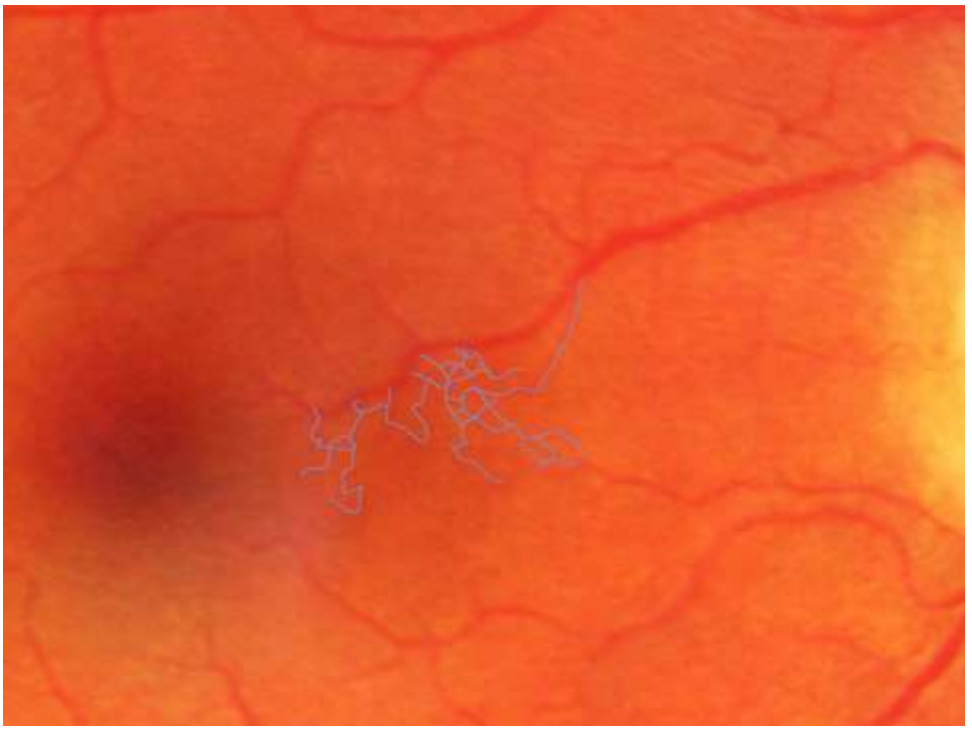


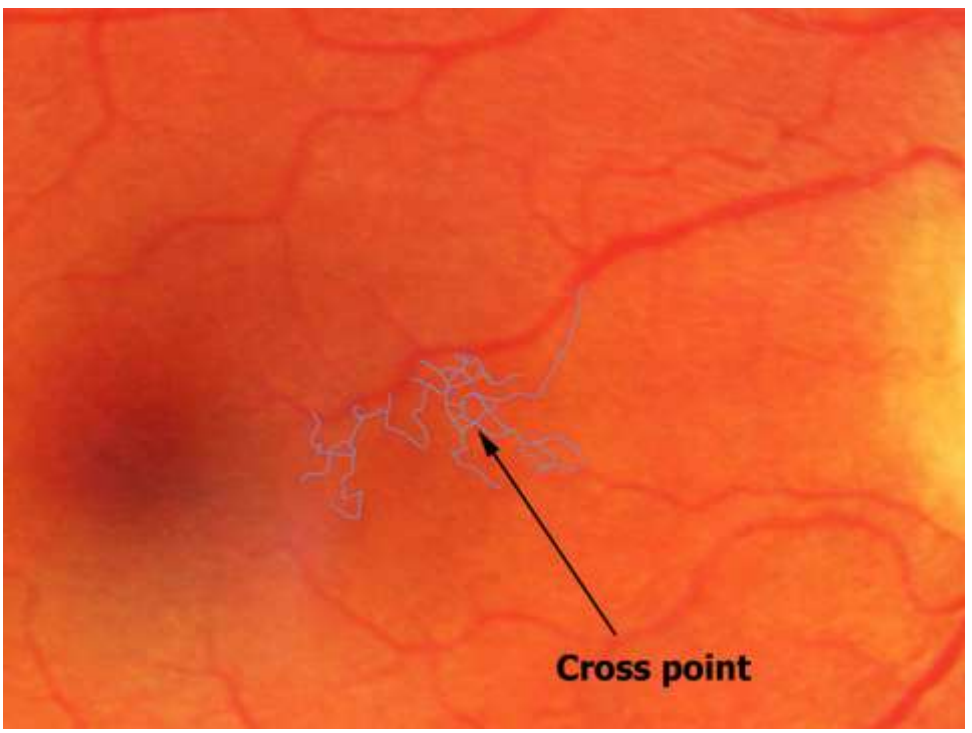

Note the diagonals are less defined

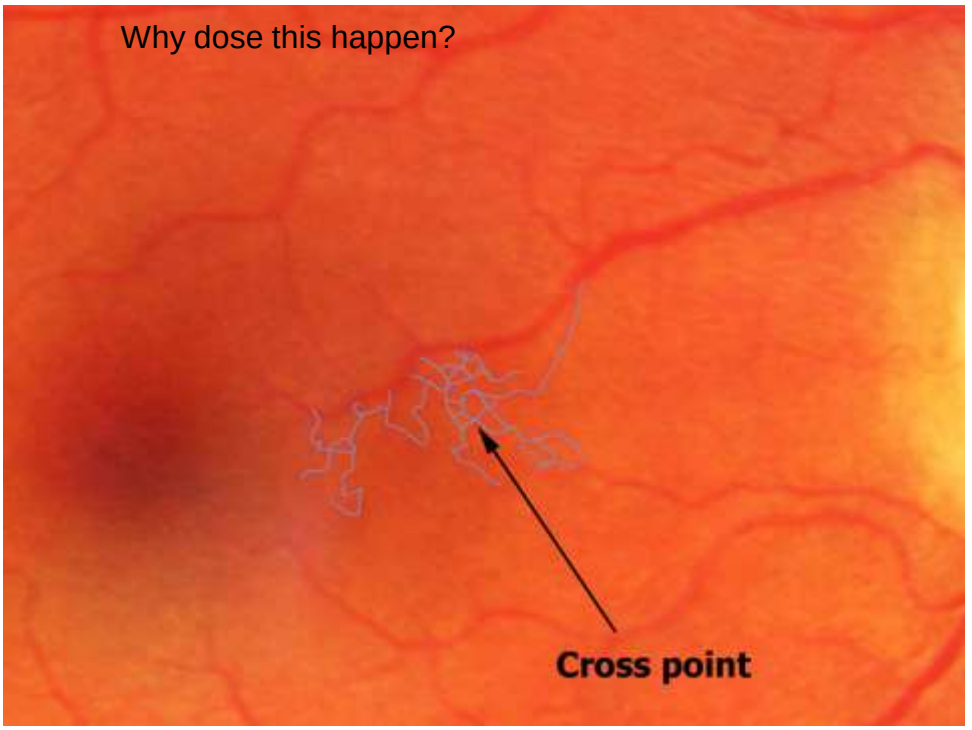

Note the diagonals are less defined








Cross point



Understanding images

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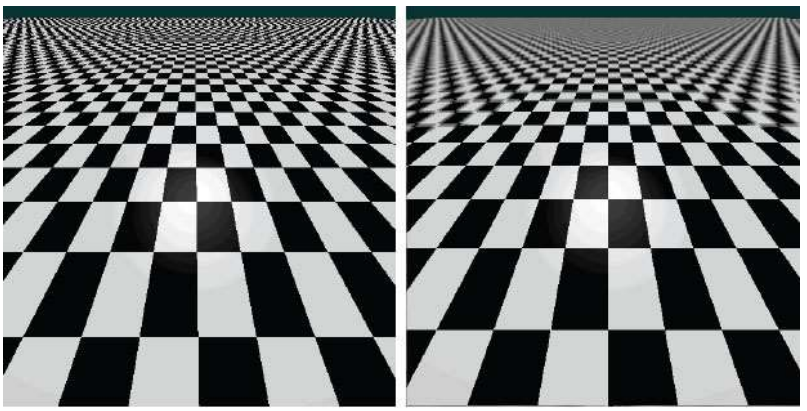
Understanding images

- Birefringent filters (anti-aliasing, blur) are used as spatial low-pass filters in electronic cameras, where the thickness of the crystal is controlled to spread the image in one direction, thus increasing the spot-size.
- The typical implementation in digital cameras is two layers of birefringent material such as lithium niobate or Calcite, which spreads each optical point into a cluster of four points.

Understanding images

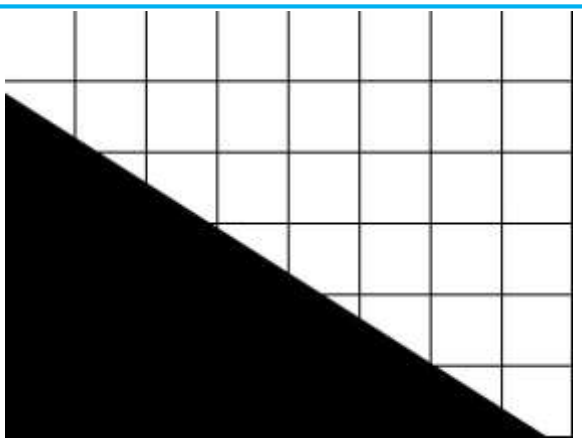
1 peace of Calcite – note the 'double vision' effect

Understanding images



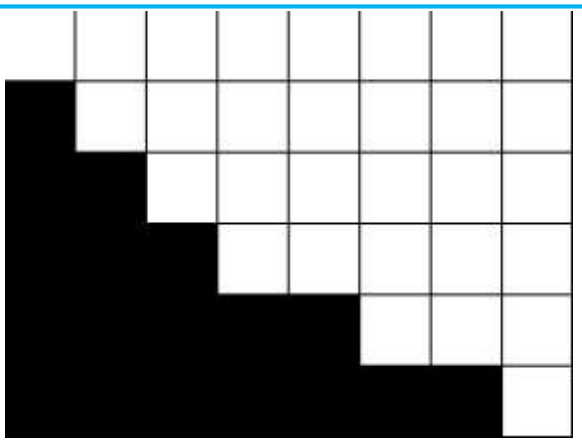
aliasing effects anti-aliasing

Understanding images



A straight line crosses the path of a CCD or CMOS chip

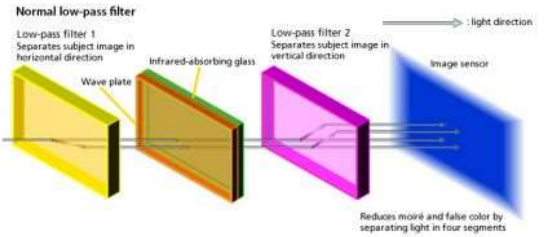
Understanding images



The line crosses the squares, rectangles or with some cameras hexagons and a calculation based on percentages will dictate if a pixel is visible

Understanding images

Here Lithium based filters joined to make up the layers of Birefringent with IR filters (these are typically found in older video cameras)



Understanding images

As a result the image is spread in to 4 points for each sensel on the CCD or CMOS chip inside the camera

Understanding images

- The choice of spot separation for such a filter involves a tradeoff among sharpness, aliasing, and fill factor (Adrian Davies and Phil Fennessy Digital imaging for Photographers forth addition 2001)

Understanding images

Mr Maeda (far right) and colleagues at the Dpreview.com Photokina meeting.

- **Question: Would you ever consider removing the anti alias (low pass) filter - or using a lighter one - on high end, high resolution models such as the EOS 1Ds Mark III, to improve pixel level sharpness, removing any moiré in software (like medium format cameras)?**
- Canon answer: "We believe the potential for false color moiré effects would be a disadvantage for the customer, so no."

Understanding images

- A “The world is not flat” moment
- Digital SLR’s (at the moment) will not resolve information better then film because of this filter and as a result digital cameras can ‘lie’

Understanding images

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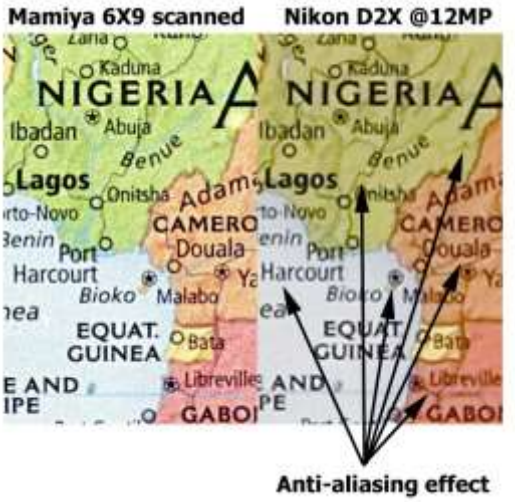


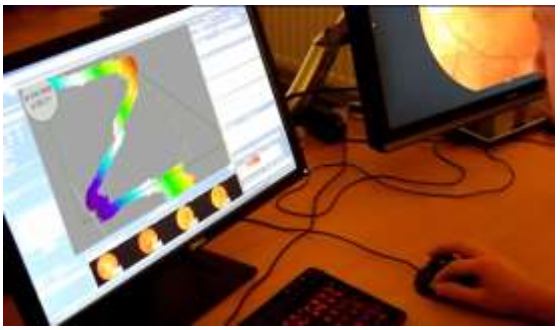
Understanding images

healthintelligence

- On the left we a lot of the berries have disappeared on the left image.
- The only berries shown are where there were larger groups of them, a single pixel size berry is unlikely to match up with a single red pixel whereas a group of berries covering 2x2 sensor pixels will definitely hit a red filtered one

Future research

To devise a simple, fast and low-cost method for glaucoma assessment using digital image analysis of the angle and optic nerve in human subjects.

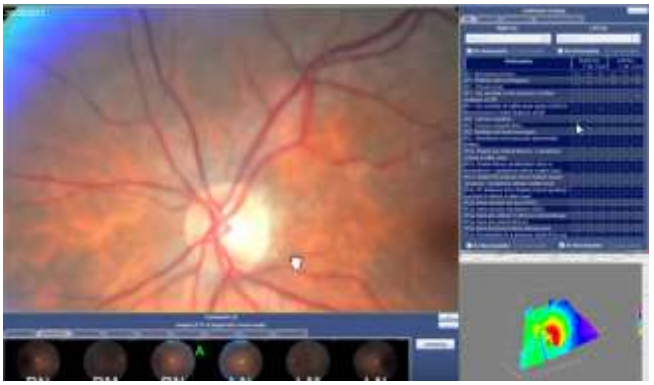


Future research

A recent study predicted a total of 79.6 million people will be affected by glaucoma in 2020. Out of these, bilateral blindness was estimated to occur in 11.2 million.

Future research

No screening tool has yet been cost-beneficial and current effort focuses on how to manage and follow the increasing number of patients with glaucoma.



Future research

In this pilot study, we present the information that is to be gained from color photographs of the fundus and the chamber angle, regarding glaucoma.

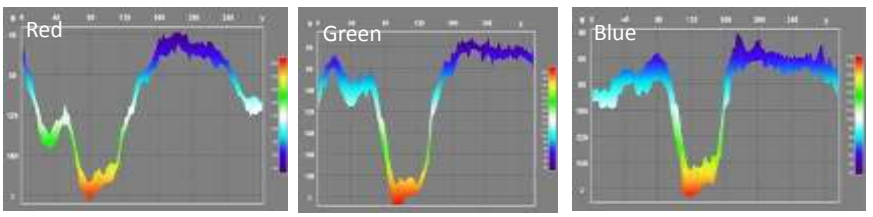
Future research

1. A total of ten glaucoma patients attending the glaucoma services at the Department of Ophthalmology, University of Szeged, Hungary were included.

2. All patients had color fundus photographs, standard optic nerve optical coherence tomography (OCT) and additional digital slit lamp images of the angle taken.

3. Digital image conversion and analysis of the angle using Image J (NIH, USA) Angle and optic nerve images, were analyzed separately in the Red, Green and Blue (RGB) channels followed by 3D volumetric analysis of the degrees of angle depth and cup volume of the optic nerve.

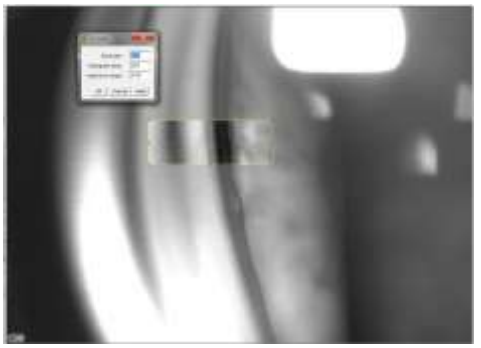
Future research



Measurement took place of the image intensity in the angle in the Red, Green and Blue channels obtained from a gonioscopy image.

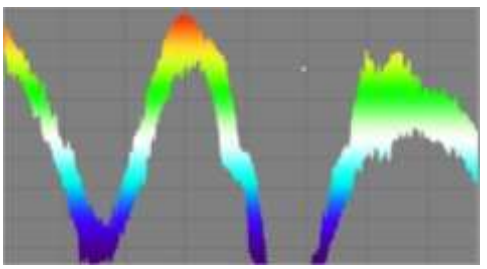
Future research

After application of Contrast Limited Adaptive Histogram Equalization (CLAHE) in the regions of interest (ROI), the images were converted into a 3D representation in Image J by adjusting volumetric measurements of the image intensity through a 3D rendering function.



Future research

Normalization of the histographic information across each image was achieved as volumetric representation and was derived from image intensity.



Future research

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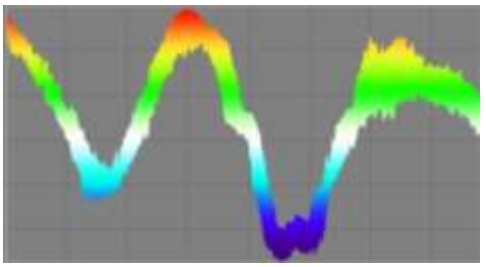
Normalization of the histographic information across each image was achieved as volumetric representation and was derived from image intensity.



Future research

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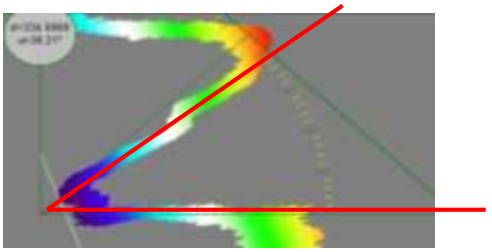
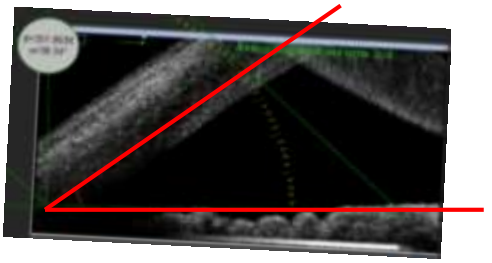


Comparison of the angle in to that obtained by anterior OCT measurement

Future research



Comparison of the angle in to that obtained by anterior OCT measurement

Future research

By applying the same contrast enhancement and volumetric measurement techniques on the temporal corneal periphery in photographs of the anterior segment, we can simulate the examination without the need of an additional light source for the slit beam.

Future research

While spectral domain OCT is rapidly progressing in the area of optic disc and chamber angle assessment, rising health care costs and lack of availability of the technology, opens demand for alternative forms of image analysis in glaucoma.

Thank you for your time