Smartphone anterior segment photography as a triage tool for hospital emergency eye care services

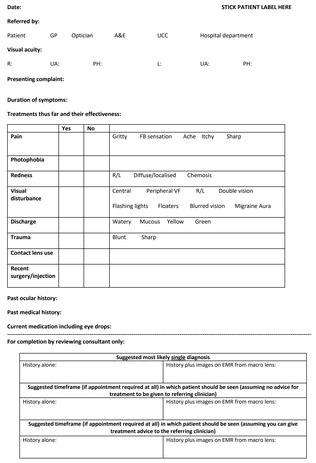
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Introduction

- Hospital eye casualty services have remained open throughout the pandemic. There has been a drive to safely minimize face-to-face consultations where possible to reduce the number of hospital attendances.
- The majority of presentations to emergency eye services has been shown to be secondary to anterior segment pathology. We evaluated a smartphone lens attachment (Quickvue, Visuscience Ltd., Shanghai, China) as an adjunct to triage in our eye casualty service.



Figure 1: Picture of lens attachment as used in our study



Date: **STICK PATIENT LABEL HERE**

Referred by:

Patient GP Optician A&E UCC Hospital department

Visual acuity:

R: UA: PH: L: UA: PH:

Presenting complaint:

Duration of symptoms:

Treatments thus far and their effectiveness:

	Yes	No	
Pain			Gritty FB sensation Ache Itchy Sharp
Photophobia			
Redness			R/L Diffuse/localised Chemosis
Visual disturbance			Central Peripheral VF R/L Double vision Flashing lights Floaters Blurred vision Migraine Aura
Discharge			Watery Mucous Yellow Green
Trauma			Blunt Sharp
Contact lens use			
Recent surgery/injection			

Past ocular history:

Past medical history:

Current medication including eye drops:

For completion by reviewing consultant only:

Suggested most likely single diagnosis	
History alone:	History plus images on EMR from macro lens:
Suggested timeframe (if appointment required at all) in which patient should be seen (assuming no advice for treatment to be given to referring clinician)	
History alone:	History plus images on EMR from macro lens:
Suggested timeframe (if appointment required at all) in which patient should be seen (assuming you can give treatment advice to the referring clinician)	
History alone:	History plus images on EMR from macro lens:

Figure 2: Questionnaire as used in our study

Methods

- Anterior segment photography with white and blue illumination was captured and a questionnaire simulating the level of information that could be expected in a referral was completed.
- Patient diagnosis, the appropriate timeframe within which the reviewing clinician felt that the patient could safely have been reviewed within and whether the patient could have been managed without attending the hospital were also recorded.

Results

- An independent Consultant Ophthalmologist subsequently reviewed the questionnaire only, documenting the most likely diagnosis, the time-frame in which they would review the patient and their confidence in the decision. They then repeated this process with the addition of photographs.
- Diagnostic accuracy was 98.15% with photographs and questionnaires compared to 48.15% with questionnaires alone. The time-frame within which patients would have been reviewed in was significantly longer with photographs and questionnaires compared to questionnaires alone ($p<0.05$). Clinical confidence in the decision making process was significantly greater with the addition of photographs ($p<0.05$).

Diagnosis	Number of Patients	Diagnosis	Number of Patients	Diagnosis	Number of Patients
Acute anterior uveitis	6	Dacryocystitis	1	Subconjunctival haemorrhage	2
Dry eyes	4	Perforating Peripheral Ulcerative Keratitis	1	Blepharitis	2
Corneal abrasion	4	Episcleritis	1	Ptosis secondary to dermatochalasis	2
Contact lens related corneal ulcer	3	Trichiasis	1	Marginal keratitis	2
Viral conjunctivitis	3	Entropion	1	CN6 Palsy	1
Pre-Septal cellulitis	3	Neurotrophic corneal ulcer	1	Dendritic ulcer	1
No Pathology	3	Hyphaema	1	Lid Laceration	1
Corneal foreign body	2	Corneal scar	1	HZO Keratouveitis	1
Basal cell carcinoma	2	Chemical injury	1	Conjunctival inclusion cyst	1
Suture Irritation	2	Ectropion	1		

Figure 3: Diagnoses of the 54 patients included in our study

Discussion

- Smartphone based anterior segment photography was shown to have remarkable diagnostic accuracy. This was helped with the presence of both blue and white light photographs for each patient.
- Image capture was made directly to the patient's electronic medical record in our study using the PowerChart Capture iOS application

Discussion continued

- Potential sources of bias include the knowledge of the photographer of the clinical diagnosis which might have led them to accentuate the relevant clinical findings in the photographs they captured
- Minimal end user training is required to use this device. Patient positioning requirements are eliminated and this device is particularly useful for ward reviews or in bed-bound patients.

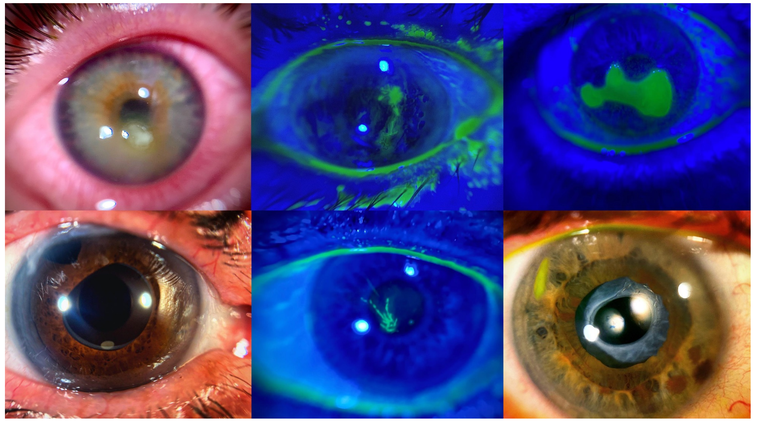


Figure 4: Sample images as captured during our study

Conclusions

- Smartphone anterior segment photography is an effective adjunct to conventional triage. Beyond the pandemic, it may prove useful in managing the ever increasing demands faced by emergency eye services.
- Coupling this technology with handheld non-mydriatic fundus photography, whose image quality has vastly improved in recent years, provides non-ophthalmologists with a toolkit to perform reasonably comprehensive, digital eye examinations.