

Photo courtesy of Fayiz Mahgoub, OD

PRACTICAL STEPS TO ELEVATE YOUR SLIT-LAMP PHOTOGRAPHY



Obtaining high-quality images using a smartphone can be an asset to patient education.

BY FAYIZ MAHGOUB, OD

How many times have you started to explain the findings of your slit-lamp evaluation to a patient, only to watch their eyes glaze over? At times like these, we instinctively reach for our eye model and proceed to give an

impromptu anatomy lesson. We pull out our most creative analogies in an attempt to translate complex physiological processes into everyday terms. But what if the ideal solution to this problem is already in our pockets?

We all have smartphones that

can capture high-definition images and videos. Being able to use these devices to show patients high-quality photographs of their eyes would be a game-changer in our patient education efforts. It would also go a long way toward gaining patient buy-in for recommended treatments and would instill a sense of accountability by allowing patients to witness the positive effects of compliance on their eye health. This imaging modality could also contribute to several revenue streams for the practice, including photography reimbursement from health insurance plans, as well as a potential increase in recommended in-office procedures and sales of at-home treatments (eg, warm compress masks, eye drops, and supplements).

Given such benefits and the ubiquity of smartphones, why hasn't slit-lamp photography become a mainstream imaging modality? The truth is, capturing a freehand slit-lamp image with a smartphone is not nearly as easy as capturing a typical smartphone photograph. Although it is possible, taking freehand photos often disrupts the examination workflow and increases chair time. For smartphone use to gain mass adoption as an imaging modality, we

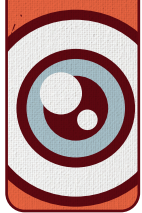


TABLE. Pros and Cons of Using a Slit-Lamp Smartphone Adapter

METHOD OF IMAGE CAPTURE		
BY HAND		USING AN ADAPTER
Pros	• No need to source additional equipment • No additional expenses incurred	• Eliminates the learning curve associated with freehand photography • Minimizes effect on chair time because image capture requires fewer attempts • Larger field of view • Gives the provider two hands to operate the slit lamp, manipulate the eyelids, and use clinical instruments • Proper stabilization for capturing high-quality videos
	• Steep learning curve to hold the smartphone steady • Increased chair time to take multiple photographs to ensure that at least one is properly focused • Smaller field of view • Reduced functionality because operator only has one hand to control the slit lamp, manipulate the eyelids, or use clinical instruments • Not ideal for recording videos because of a lack of stability	• Requires sourcing additional equipment • Involves an additional expense

must improve the usability, efficiency, and image quality of smartphone slit-lamp photography.

USABILITY AND EFFICIENCY

Improvements in usability and efficiency can be achieved by using a dedicated slit-lamp smartphone adapter, rather than trying to take photographs by hand (Table). The Smartphone Universal

(EyephotoDoc) and the iSLA (Augmented Vision Labs) are adapters specifically designed for use with slit lamps.

LIGHTING

The quality and quantity of illumination is just as important as the quality of your smartphone camera. The biggest variables affecting light quality are diffusion and color tem-

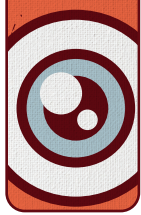
perature. Diffuse light offers uniform illumination of a large area and is helpful when examining structures that don't require high magnification such as the ocular adnexa, eyelids, and conjunctiva. Diffusion can be achieved by using diffusers that were built into your slit lamp or by placing a semi-transparent filter (such as a cough syrup measuring cup) over the slit lamp's light source. In addition, neutral or daylight-balanced color temperature (ie, 5,500 K) is ideal because it helps to ensure that findings such as conjunctival hyperemia are represented accurately in photographs. A good way to achieve brightness or color temperature balance is to use an LED module or an external light LED light source, which can be obtained from companies such as EyePhotoDoc and Augmented Vision Labs.

CAMERA SETTINGS

Smartphones are designed to automatically adjust camera settings to fit a wide variety of scenes both indoors and outdoors. To get the most out of smartphone cameras, it's necessary to

AT A GLANCE

- ▶ Being able to use a smartphone to show patients high-quality photographs of their eyes would be a game-changer in our patient education efforts.
- ▶ The largest improvements in usability, efficiency, and image quality can be achieved by using a dedicated slit-lamp smartphone adapter, rather than trying to take freehand photographs.
- ▶ The quality and quantity of illumination is just as important as the quality of the smartphone camera.



TO GET THE MOST OUT OF SMARTPHONE CAMERAS, IT IS NECESSARY TO GET COMFORTABLE WITH ADJUSTING A FEW IMPORTANT SETTINGS MANUALLY. AMONG THESE ARE FOCUS AND EXPOSURE.

get comfortable with adjusting a few important settings manually. Among these are focus and exposure. With focus, it's best to disable (or lock) the phone's autofocus feature and adjust the focus using the slit lamp's joystick instead. This is because smartphone autofocus algorithms are not optimized for ocular photography; rather, they are designed to keep a face in focus in the middle of a landscape scene, for example. They are not designed to keep an iris or a cornea in focus as a slit lamp is repositioned. Autofocus actually makes it harder to see these structures clearly because it will continuously "hunt" for focus as you try to focus the slit lamp with the joystick.

To lock the autofocus on most smartphones, press and hold on the part of the screen that shows the structure you want to capture. The phone will estimate the ideal focus and exposure values for that part of the image and lock them in place. A confirmation message should appear that reads something like, "AE/AF LOCK." You can then rely on the slit-lamp's joystick to refine focus of the image without worrying about the camera's focus and exposure

readjusting constantly.

Depending on the illumination technique, you may need to manually adjust the exposure value. For example, the image may be overexposed (ie, too bright and washed out) when using a wide-open slit beam to illuminate the entire eye and adnexa, or it may be underexposed (ie, too dark and grainy) when using a narrow slit beam. You can manually adjust the exposure typically by sliding your finger up or down on the screen after seeing the autofocus/auto exposure lock confirmation message.

To gain manual control over additional camera settings, such as ISO, shutter speed, and white balance, as well to unlock features such as shooting in uncompressed formats (ie, RAW format), you can download a third-party camera application; Pro Camera by Moment (iOS) and Open Camera (Android) are two options to unlock additional camera features. Another feature to look for when considering third-party camera applications is the ability to save setting profiles so you don't have to reconfigure your preferred settings each time.

One feature in all smartphones

that is not recommended for slit-lamp photography is pinch to zoom because most smartphones apply a digital zoom, not an optical zoom. Digital zoom reduces the detail of your images because it crops your images in real time and excludes a lot of the data that would otherwise be captured. Better results can be obtained by increasing the optical magnification on your slit lamp to achieve the desired level of magnification. You can then crop your photos after capturing them, if you wish to remove the black borders that typically exist in smartphone slit-lamp photos. These borders can be minimized by using a slit-lamp phone adapter, which lets you mount your phone at the optimal vertex distance for your slit-lamp ocular, thereby giving you the largest field of view possible.

SEIZE THE OPPORTUNITY

Imaging modalities such as fundus photography and OCT have transformed how we diagnose and manage posterior segment disease. The influence that these modalities have had on how we educate our patients and colleagues has been just as profound. We have the potential to see a similar effect by using smartphones to capture anterior segment photos (see the online version of this article at modernod.com for examples). My hope is that we will seize the opportunity to offer better patient education and superior clinical care and to achieve better practice success. ■

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