LETTER TO EDITOR

Effectiveness of Smart Phone Use for Clinical Photograph

Devananthan Ilenghoven[1,2,3,4*], Nur Azida Mohd Nasir[3,4], S. Fatimah Noor Mat Johar[3,4], Shah Jumaat Mohd Yussof[1,2]

[1]Plastic Reconstructive & Aesthetic Surgery Unit, Faculty of Medicine, UiTM, Kampus Sg. Buloh, 47000 Sg. Buloh, Selangor
[2]UiTM Hospital, 42300 Bandar Puncak Alam, Selangor
[3]Reconstructive Sciences Unit, School of Medical Sciences, USM, 16150 Kota Bharu, Kelantan
[4]USM Hospital, Kubang Kerian, 16150 Kota Bharu, Kelantan

Address of corresponding author:
Plastic Reconstructive & Aesthetic Surgery Unit, Faculty of Medicine, UiTM Kampus Sg. Buloh, 47000 Sg. Buloh, Selangor, Malaysia
Email:
i.devananthan@gmail.com

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Dear Editor,

Clinical photography is an essential process in current medical practice for surgical procedure planning and outcome evaluation. Clinicians help to enhance patient care while demonstrating their treatment methods and skills. High-quality images complement the pre-procedure assessment, diagnosis, post-procedure documentation and medical education. Additionally, it serves as teaching material for publication, medicolegal documents, and proof of example in court cases. In this digital era, post-procedure good outcome photos function to promote potential clients and boost one's private practice visibility.

The advancement of technology has made it possible to produce high-quality imaging with minimal technical expertise and a more straightforward device. The cost and mobility achievable with current devices allow photography to be practical in clinical and operative theatre settings. The gold standard for medical photography was confined to digital cameras single-lens reflex (DSLR) devices where high quality, consistent, reproducible, and predictable images could be produced. However, the usage of DSLR requires training, technical skills, and experience to provide efficient photos.

Keeping up with the expansion of digital photography, smartphone cameras can potentially replace DSLR, mirrorless and even compact digital cameras for daily practical use. Portability, size, build-in applications of smartphones eliminate the need to carry multiple devices for clinical photography. The smartphone manufacturers engagement in 'camera wars' since 2019 are incorporating excellent cameras, backed up by even better software. Smartphones in our pockets can rival mirrorless cameras and are integrated with advanced processing techniques to create photographs that mimic professional systems. Camera capabilities are advancing to a higher megapixel lens with a bigger sensor, simplified shooting process, and faster image production.

Multiple surveys among physicians show smartphones usage for clinical photography and related communication. Despite the advantages of smartphone photography, explicit consent, patient confidentiality, and secure image storage are areas that need further study and governance. We need to further explore matters concerning data security and breach, contingency methods for stolen or lost devices, and policies in place on smartphones photography by our Ministry of Health.

As outlined by Hagan, [1] a few principles of photography that are addressed include (1) Accuracy vs favorability; showing off every detail present on the subject, in contrast, to portrait photography where fine details are removed. (2) Consistency; the same way every photograph is taken with standardizing the lighting, precise patient positioning to camera angle, consistent background, patient exposure and clothing. (3) Identical magnification for comparative images; same camera distance from a patient for pre-and post-procedure imaging to provide standardization and avoid distortion.

Light exposure plays an essential role in the quality of imaging, and the knowledge of the Exposure Triangle is vital, which comprises the aperture(depth-of-field), shutter speed (light) and International Standards Organization (ISO) Speed (texture and noise). A low ISO speed of 100-200 is preferred in medical photography to give a smoother, less grainy image (minimal digital noise). [2] Emphasis is also given to image distortion while using a smartphone camera. The lenses autofocus preferentially uses the largest aperture when the camera application is open for the initial maximal exposure of an image. On this zoomed-out auto setting, the image can gain a fish-eye appearance. This distortion can be rectified by distancing away from the subject and taking the photo from the midway point of full zoom capability.[3]

Appreciating the above principles requires control of multiple factors for good quality photography; hence automation of this process with the sophisticated smartphone camera processing allows a greater chance of creating consistent images.

Reviews for the best smartphone camera for the past year by multiple tech websites placed the Samsung Galaxy series, Apple iPhone Pro Max series, and Google Pixel series as top choices by experts. Most smartphone cameras in this category utilize a quad-camera which includes a depth sensor to get better portrait effects. The primary camera sensor combined with an ultra-wide lens and telephoto lens creates a professional quality close to DLSR.

Camera Settings and Methodology

We explain our method using iPhone 12 Pro Max (Apple Inc., Cupertino, CA, USA) for clinical photography. Images are taken in Portrait mode to create a depth-of-field effect with a sharp focus. Fine details usually wiped out in this mode by the older generation of the camera were preserved using the Natural Light setting. (Figure 1) The blurring of background that occurs in Portrait mode was corrected by increasing the Depth Control to f/16. For images taken with Studio Light setting, the shutter speed was set to f-60. (Figure 2) The ISO speed was set automatically by the phone processor algorithm following the aperture and shutter speed setting. To reduce image distortion, a fixed distance of 100cm with 2.5x zoom was used. Image with minimal soft shadow and distortion was produced within seconds without technical difficulties. (Figure 3)

The versatility of smartphone editing allows the Portrait mode effect removed or added back by a simple tap on the image. High-resolution image saved in the smartphone cloud

system allows easy image storage and retrieval. This method is advantageous by reducing the time taken for data transfer and storage using hardware. Furthermore, storage failure, corrupt data or hardware device malfunction can be avoided. However, to prevent a breach of patient confidentiality, we advocate using specific apps created for medical image storage that incorporates consent taking before imaging. Storage apps allow easy organization and cross-referenced filing system.

A designated area for photography allows correct views for specific procedures, careful patient positioning, consistent light setting and well-contrasted background. A setup of a dedicated area for photography of facial portraits was prepared for our study. A similar setup like this is ideal for pre- procedure and follow-up in the clinical setting for smartphone photography. In our studio, to achieve adequate lighting, we used two 150W 5500K strobe lights, each inside a 50cm x 70cm softbox and with a separate power supply. They were positioned 5-10cm higher from eye level at 45 degrees angle on either side of the patient. We used a neutral white background for our setup. Another popular background used is light blue which reduces distraction and complements all skin complexion.

Participants were placed to sit erect, with a neutral face and head brought to Frankfort horizontal plane. The smartphone was mounted to a tripod for a fixed distance and magnification setting. A ruler was placed beside the patient to help indicate the actual dimensions of the photographed area. We utilized Adobe Photoshop (Adobe System Inc. San Jose, CA, USA), a computer application software, to edit and manipulate digital images for anthropometric measurements. Under the heading of Image and Analysis, a custom measurement scale was set where we measured ruler length to pixel length. Pixel length was set to logical length and unit. We measured one centimetre of the ruler length in pixels corresponding to ten millimetres for logical length. (Figure 4)

Furthermore, with the current ongoing COVID-19 pandemic, we must be vigilant while communicating with patients and minimizing contact duration. Usage of smartphone cameras allows faster image acquisition and allows immediate intra- or interdisciplinary consultation if required. Looking into all the factors mentioned earlier, we should move concurrently with the advancement of technology and simplify the way we work without compromising the quality of clinical photography.

Figure 1: Portrait mode with natural light setting, f/16,2.5x, auto ISO

Figure 2: Portrait mode with studio light setting with exposure of f-60

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Figure 3: Image produced in Portrait mode with appropriate studio light setup

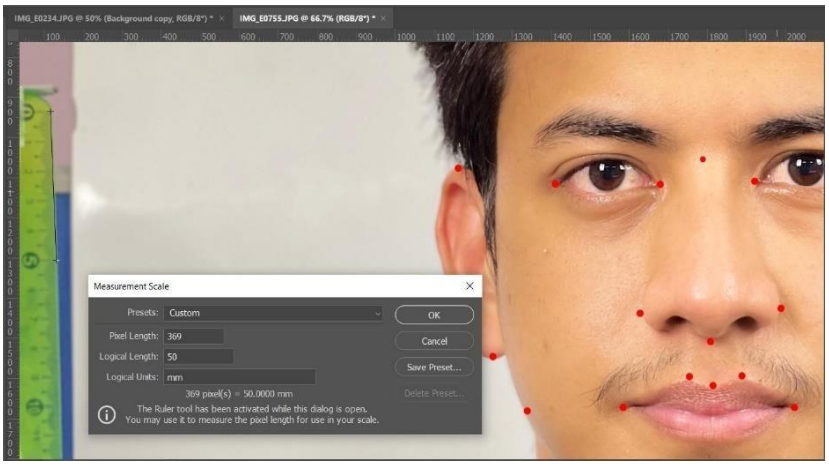

Figure 4: Custom scale measuring pixel length with Adobe Photoshop software.

(Note: Written informed consent was obtained for photos to be included in this letter)

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