

Patient perceptions regarding the use of smart devices for medical photography: results of a patient-based survey

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Abstract

Aim To assess patient perceptions regarding medical photography and the use of smart devices, namely mobile phones and tablets for medical photography.

Methods A questionnaire-based survey was conducted among 280 consecutive adult patients who presented to the oculoplastics clinic at a tertiary eye care centre. The responses were tabulated and analysed.

Results Of the 280 patients surveyed, 68% felt that medical photography had a positive impact on their understanding of their illnesses and 72% felt that the

use of smartphones for medical photography was acceptable. Respondents below the age of 40 years were more likely to approve of the use of mobile phones for photography as compared to those over 40. Most patients (74%) preferred a doctor to be the person photographing them. While a majority approved of doctors and trainee physicians having access to their photographs, they felt non-physician healthcare personnel should not have access to clinical photographs. Also, 72% of the respondents felt that the patient's consent should be taken before using their photographs. It was noted that patient identification and breach of confidentiality could be some of the potential issues with using smart devices as cameras in the clinic.

Conclusions Clinical photography in general and, specifically, using smart devices for clinical photographs have gained acceptance among patients. The outcomes of this study may be utilized to create policy guidelines for the use of smart devices as photography tools in the clinics. The findings of this survey can also help to create standardized, uniform patient consent forms for clinical photography.

Keywords Clinical photography · Mobile phones · Camera · iPad · Tablet · Consent · Ethics

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Introduction

External photography is an important tool in the practice of medicine. Standardized pre- and post-surgical photographs can help the patient understand the nature of the condition and the outcome of surgery [1].

Medical photography itself has rapidly evolved in the past few years. There are now standardized views and guidelines for documenting most conditions [1, 2]. Most smart devices—namely, phones and tablets are also equipped with cameras that can capture images that are of acceptable quality. However, smart devices are primary instruments of communication and only secondarily do they serve as photography devices. Given the ease with which data may be shared from such devices, issues of breach of patient confidentiality, privacy and lack protection of images and patient data on the device may pose ethical and legal dilemmas [3, 4]. Recent publications do not discuss the aspects of patient confidentiality, privacy and breach of trust. Nor do they address the patient's comfort levels with using mobile devices to shoot photographs. Hence, there is a need to look for a middle path that strikes the perfect balance the potential ethical problems that may arise from using smartphones in the clinic and the potential benefit of using such devices for medical photography [3].

Therefore, this study was devised to assess not only the perception among patients regarding medical photography, but also the use of smart devices, namely mobile phones and tablets as cameras for the purpose for external facial photography.

Materials and methods

A cross-sectional survey was conducted among 280 consecutive adult patients who presented to the Ophthalmic Plastic Surgery clinic at Lokmanya Tilak Municipal Medical College, Mumbai, India, between March 2016 and May 2016. Children were excluded from the study, and all participating adult patients (over 18 years of age) were given a questionnaire, which they had to fill out. As per protocol, after consultation with the consultant, all patients requiring external photographs were photographed after obtaining a written consent that clearly explained the aims and objectives of photography and the possible use of

patient photographs for reviewing, presentations, patient education and publications. The consent form was stored in the medical records of the patient. All patients were photographed using a department-owned smartphone—Moto X Play, equipped with a 21 megapixel camera with $f/2.0$ aperture lens (Motorola, Chicago IL, USA) and a digital camera, Sony NEX-5 with a 18–55 mm lens (Sony Corporation, Minato, Tokyo, Japan) by the examining doctor. Following this, the patients were explained the nature of this survey and those who agreed to participate were given the written questionnaire. The questions that were asked to the participants are tabulated in Table 1. The patients' diagnoses were primary oculoplastic in nature requiring facial photography such as ptosis, facial palsy, dermoid cysts and eyelid tumours.

All responses to the survey were tabulated in Microsoft Excel. When appropriate, statistical analyses using the Chi-square test were done. We considered a p value < 0.05 as statistically significant. All statistical analyses were performed with GraphPad Prism 6[®] (GraphPad Inc., La Jolla, CA, USA).

Results

Demographics

The mean age of the population surveyed was 40.25 years (range 18–82 years). One hundred and fifty-four respondents (154/280; 55%; 95% CI: 0.49–0.60) were men (Table 2). While all respondents owned cell phones, more than half of the participants (145/280; 51.8%; 95% CI: 0.46–0.57) owned smartphones with touch screens and cameras.

Perceptions on clinical photography

Most patients (99.6%; 279/280) felt that medical photography was useful in documenting medical conditions as a part of the patients' records. Of the 280 patients surveyed, 67.9% (190/280; 95% CI: 0.97–0.99) felt that medical photography had an impact on their own understanding of the disease and its treatment.

A majority (89.3%; 251/280; 95% CI: 0.85–0.92) of the patients agreed that medical photography had a role to play in medical education, and nearly half the patients (50.9%; 143/280; 95% CI: 0.45–0.57) felt that

Table 1 List of questions included in the questionnaire

1. Age:
2. Sex:
3. Do you own a smartphone/camera phone?
 - a. Yes
 - b. No
4. Do you think it is acceptable to use smartphones for photography in the clinic?
 - a. Yes
 - b. No
5. Do you think that medical photography has any impact of your treatment?
 - a. Yes
 - b. No
6. Do you think it is acceptable to show a patients photograph to another patient for illustrative/ demonstrative purposes?
 - a. Yes
 - b. No
7. Which device would you prefer to be used to shoot your clinical photographs?
 - a. Hospital camera
 - b. Doctor's camera
 - c. Doctor's personal smartphone/tablet
 - d. Hospital's smartphone/tablet
8. According to you medical photography is acceptable for which of the following uses? (you may choose more than one option)
 - a. Documentation for hospital record
 - b. Teaching
 - c. Seeking second opinion
 - d. Presentations and medical journals
 - e. Research
 - f. Medical websites
9. Who would you prefer to take your photographs in the clinic?
 - a. Photographer (clinical photographer, trained for medical photography)
 - b. Doctor
 - c. Medical student
 - d. Nurse/medical assistant
10. Who should have access to your photographs?
 - a. Doctors treating you
 - b. Other doctors in the department
 - c. Other healthcare medical personnel (nurse, physiotherapist, technician)
 - d. Medical students (trainees—residents and fellows)

Table 1 continued

11. Do you have any concerns with the use of smartphones to shoot photographs in the clinic? (you may choose more than one option)
 - a. No concerns
 - b. Patient identification
 - c. Breach of confidentiality
 - d. May be sent to other unintended recipients
 - e. Others-specify _____

Table 2 Table demonstrating the demographics of the surveyed population

Sex	Number of respondents	Percentage
Sex-wise distribution		
Male	154	(55)
Female	126	(45)
	280	100
Age group	Number of respondents	Percentage
Age-wise distribution		
< 30	89	(31.8)
31–40	55	(19.6)
41–50	68	(24.3)
51–60	45	(16.1)
61–70	19	(6.8)
> 70	4	(1.4)
	280	100

clinical photographs were useful in seeking a second opinion if required. A lesser proportion of respondents (103/280; 36.7%; 95% CI: 0.31–0.42) approved of the role of medical photography in presentations and medical journals, and only 81/280 (28.9%; 95% CI: 0.24–0.34) approved of the use of clinical photographs in medical websites or as a patient information tools.

Mobile devices for photography

A relevant finding was that 72% (202/280; 95% CI: 0.67–0.77) of the patients felt that the use of smartphones for medical photography was acceptable in the clinic. Respondents below the age of 40 were more

likely to approve of the use of mobile phones for medical photography as compared to those 40 years of age and older. This difference was statistically significant ($p < 0.001$). Also, smartphone owners themselves were more likely to give their approval for cellular photography in clinics as compared to those who did not own or use smartphones ($p < 0.01$).

A majority (40%; 112/280; 95% CI: 0.34–0.46) of the surveyed population did not have any particular preference with regard to the ownership of the camera used for photography. However, 28% (79/280) of the respondents preferred a hospital-owned camera and 22% (62/280) of the patients preferred the doctor's personal camera. This difference, though was not statistically significant ($p = 0.11$). Furthermore, there was no difference among smartphone owners and those respondents who did not own smartphones in this regard.

Patient preferences

Most patients (74%; 207/280; 95% CI: 0.68–0.78) preferred a doctor to be the person photographing them. Only 16% (44/280; 95% CI: 0.11–0.20) preferred other healthcare personnel such as medical student, intern or a nurse as the photographer. A medical photographer was the least preferred person to shoot patient pictures with only 10.3% (29/280; 95% CI: 0.07–0.14) indicating a preference for them.

Access to clinical photographs

All respondents were asked regarding who should have access to patient photographs. All respondents (280/280) agreed that the treating physician must have access to patient photographs. Nearly 36% (101/280; 95% CI: 0.30–0.42) felt that other physicians within the same department should also have access to their photographs. One-third of the respondents (33%; 92/280; 95% CI: 0.27–0.38) felt that medical trainees could also have access to medical photographs. However, only 8.6% (24/280; 95% CI: 0.06–0.12) of the patients felt that other healthcare personnel such as nurses, technicians and physiotherapists should also have access to patient photographs.

Consent and concerns

Over 68% (192/280; 95% CI: 0.62–0.73) of the patients surveyed felt that it was acceptable to show a patient's photograph (including their own) to another patient, confidentially, for illustrative and demonstrative purposes. Less than 10% (27/280; 95% CI: 0.06–0.13) respondents found this unacceptable and 22% (61/280; 95% CI: 0.17–0.27) of the people were unsure of it. Of the surveyed population, 72% (202/280; 95% CI: 0.66–0.77) felt that the patient's consent should be taken before using their photographs, but 84% (235/280; 95% CI: 0.79–0.88) of the respondents felt that this consent was required only the first time and not for every subsequent use. Among the participants, 68% (190/280; 95% CI: 0.62–0.73) had no specific concerns or problems regarding the use of smartphones in clinics; however 31% (87/280; 95% CI: 0.26–0.36) of the respondents felt that patient identification and breach of confidentiality could be potential issues with using smart devices, and 9% (25/280; 95% CI: 0.06–0.13) of the patients surveyed felt that photographs could be transmitted to unintended recipients while using smart devices to shoot and store medical photographs. Smartphone owners themselves were significantly more likely to have any of the specific concerns enlisted when it came to the use of smartphones for medical photography ($p < 0.001$).

Discussion

The addition of photographs to medical reports and presentations adds credibility and reliability to the presented material [5]. The increasing use of medical photography, however, has raised many concerns regarding ethical and legal limitations. To address these issues, various medical bodies, governing councils and consensus groups have issued general guidelines for standardization of patients' information and consent forms [6].

There is scarcity of data presenting patients' perspectives on the issue of medical photography. Hacard et al. published the results of a survey where they found that medical photography was considered to be a valuable medical procedure by most patients and had high rates of acceptance [6]. Two other similar patient surveys have reported that patients uniformly

understand the role of medical photography and are accepting its use in the clinic [7, 8].

In our survey, most patients were comfortable with the camera being either hospital-owned or belonging to the doctor. However, this is in contrast to most previous patient surveys: Lau et al.'s questionnaire-based survey showed that there was a strong preference for hospital-owned equipment [7]. They concluded that although the use of a personal camera is more convenient and time efficient, its use should be discouraged. The results of Lau et al.'s results are comparable to those from other survey studies examining medical photography done by Hacad and associates in France and Hsieh and colleagues from Chicago, USA [3, 6, 7]. All these studies demonstrated a high level of acceptance for the use of hospital-owned digital cameras. In our study too, while 40% of the respondents were comfortable with any device used for photography, of the ones who did have a clear preference, the hospital-owned devices were preferred over physician-owned devices; however, the difference was not statistically significant (31.8 vs. 28.2%). Hsieh et al. have hypothesized that such preferences may be due to the perceived security [3]. The lack of access to hospital photographs after working hours also adds another level of perceived security when it comes to hospital-owned cameras over physician-owned devices [7].

Even though the above-mentioned surveys were not specifically designed to gauge acceptance levels for mobile phone medical photography, they reported that since patients preferred hospital-owned cameras, the use of mobile phones should not be encouraged. In our survey too, cameras were the preferred devices for more people (49.7%; 139/280; 95% CI: 0.43–0.55) as opposed to those who preferred mobiles and tablets (10.36%; 29/280; 95% CI: 0.07–0.14) ($p < 0.05$). But, when specifically asked about the mobile devices, our survey showed that 72% (202/280; 95% CI: 0.66–0.77) of the respondents felt that cellular medical photography was acceptable. These apparently contrasting results—the high approval ratings for mobile phone photography in general; and the preference for regular cameras as the device of choice for clinical photography—can seem confounding. However, it is important to acknowledge the subtle difference between the two and interpret the two results separately—while most patients prefer cameras; it does not necessarily amount to a rejection of mobile devices.

The higher quality of photographs, technical superiority and familiarity could be possible reasons why cameras continue to be preferred over mobile phones. Leger et al. [8] reported that other factors such as ethnicity, income and age strongly affected patient preferences about the type of equipment used for obtaining clinical images.

Furthermore, there is a perception that smart devices are always 'online' or connected to the internet, thereby raising the potential for unethical use of their medical images as opposed to cameras which are self-contained and usually require a computer terminal for sharing and also the presumed assurance of proper storage of their images. Many centres use mobile devices for photographs and subsequently use applications to upload cell phone photographs into a patient's chart through a cloud-based system that does not store photographs on the phone itself [8].

While the photographer's gender was not addressed in our survey, an overwhelming preference for a physician photographer was noted among the participants in our survey as well. It can be argued that it may not be justifiable to allot precious healthcare resources such as physician man-hours towards medical photography in the long run. Moreover, the quality of photographs shot by trained medical photography professionals potentially can be better than those shot by physicians. Patient preferences regarding the gender of the photographer should also be explored in countries such as India, where social and culturally imposed gender biases and restrictions still are commonplace.

One of the drawbacks of our paper is that the results suggest that a large proportion of the respondents themselves did not own smartphones. We, however, believe this is a true reflection of the smartphone ownership patterns among the general population, and smartphone ownership should not be one of the criteria that validate a patient's ideas or opinions regarding smartphone photography in the clinic.

Furthermore, there are significant differences between previous surveys and our survey that may be attributed to geographical and geopolitical variations: previous studies have shown that older patients, who possibly may be less familiar with cellphone photography and the associated paraphernalia of mobile photograph-sharing applications, were more permissive of cell phones for medical photography

than younger patients. However, in contrast our study found that a higher proportion of those below 40 years of age (76.6%) were accepting cellular photography as compared to whom aged 40 and above (68.34%). However, we used a high cut-off of 40 years of age to compare the responses, since the mean age of our population was 40.25 years. Similarly, Lau and colleagues' [7] survey from the UK saw high acceptance levels for healthcare professionals to have access to medical photographs (79%). In our study, only 8.6% felt that non-physician healthcare personnel should have access to medical photos. At times, it may be important to other team members such as nurses, physiotherapists to access and view clinical photographs.

We believe the survey has thrown light on patient preferences that are very clear—most of the patients are accepting smartphones for medical photography since they clearly understand the role and impact of medical photographs. While they are accepting its use for teaching, other uses such as the use of photographs on websites found lesser approval. Legislation and self-imposed regulatory guidelines such as HIPAA (Health Insurance Portability and Accountability Act, 1996 in the USA) in some countries have ensured that patient identity is not compromised; this is not the case in other countries. Many developing countries such as India do not have clear guidelines on these issues [9]. Also, photography etiquette and preferred practice patterns when it comes to medical photography are not areas that are stressed on during residency and fellowship training. Leger et al. have very succinctly put forth 'best practice recommendations' in their paper on patient perspectives on medical photography in dermatology [8].

Even if photographs are shot using a smartphone, the storage of these photographs must be secure with restricted access only to medical personnel. Many surgeons store patient photographs among personal photographs and have also accidentally shown them to friends and family, further underscoring the need for secure cloud storage with restricted access [10].

A consent form for medical photography must clearly enlist all the possible uses of clinical photographs including possible publication in journals, books, presentations, websites and patient information material [11]. As pointed by Natarajan and Nair, photographs if stored on the phone/tablet may be sent to other recipients. This transmission is irreversible,

and the images once transmitted are permanently stored in the archives of the recipients—the further usage of which, the original sender has no control over. Any recipient who views the photograph on applications such as WhatsApp can easily download it and use it, not only flouting the tenets of ethical practice but also stealing intellectual property [9]. The consent form may also specify that the photograph may be taken using a smartphone/tablet; however, after inclusion of the photographs into the electronic medical records, the photograph will be deleted from the device. The storage of such photographs must be secure and readily retrievable.

While we do not aim to pass a judgment of the cogency, appropriateness and legality of using smartphones for clinical photography, we believe it is important to understand how patients view this recent development in the clinic and recognize patients' levels of acceptability of mobile photography in the doctor's office in order to take it to the next step of standardization and validation. While certain geographical variations in the perceptions of patients are noted, in general, in the present scenario, it appears that most patients are comfortable with the use of mobile phones to shoot clinical photographs. Therefore, healthcare providers and regulatory bodies must accommodate patient preferences as well as inputs from the medical and legal teams while formulating policies, consent forms and further guidelines.

Compliance with ethical standards

Conflict of interest None of the authors have any conflicting interests pertaining to this manuscript to disclose.

Human and animals participants No intervention was performed on human participants or animals in this project. This study was carried out in line with the Declaration of Helsinki and was approved by the Ethics Research Committee.

Informed consent All subjects having participated in the study provided written informed consent prior to participation in the questionnaire.

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