Original Article

Practice of External Ocular Photography Among Ophthalmologists in Nigeria, Sub-Saharan Africa

Olufisayo T. Aribaba[1,2], Oluwatobi O. Idowu[3], Kareem O. Musa[1,2], Temiloluwa M. Abikoye[2], Onyinye M. Onyekwelu[2], Adeola O. Onakoya[1,2], Folasade B. Akinsola[1,2]

[1]Department of Ophthalmology, Guinness Eye Center, College of Medicine, University of Lagos, [2]Department of Ophthalmology, Guinness Eye Centre, Lagos University Teaching Hospital, Lagos, Nigeria, [3]Department of Ophthalmology, University of California San Francisco, CA, USA

Abstract

Background: External ocular photography (EOP) has become an essential tool in the day-to-day practice of ophthalmology as it entails the imaging of the external eye, ocular adnexa, face, and the anterior segment of the eye. The aim of this study was to assess the practice of EOP among ophthalmologists in Nigeria with a view to providing baseline information that will be useful in the advancement of ophthalmic practice. **Materials and Methods:** An online cross-sectional survey among practicing ophthalmologists in Nigeria. Information regarding reasons for external photography, type of camera, ownership of camera and barriers to external photography were obtained. The data obtained were analysed using IBM Statistical Package for the Social Sciences version 22.0 software for Windows (IBM Corp., Armonk, NY, USA). **Results:** A total of 183 out of 355 ophthalmologists completed the survey (51.5% response rate), with a mean age of 43.9 ± 8.1 years. Of the respondents, 84.7% use EOP in their practice with 53.6% making use of smartphones. Indications for the use of EOP were documentation (71.0%), teaching purposes (54.2%), patient's communication (47.1%), and surgical/treatment planning (45.8%). Among the users of EOP, 87.1% obtained consent and only 5% use written informed consent. There is an association between obtaining consent and younger years in practice ($P = 0.005$). **Conclusion:** The use of EOP is high among ophthalmologists in Nigeria and with its increasing popularity comes the need for ethical and medicolegal considerations, especially in oculoplastic practices. Most importantly, whenever the effective concealment of patient's identity and privacy cannot be guaranteed during clinical photography, the use of oral consent may be inadequate.

Keywords: External ocular photography, Nigeria, ophthalmologist, practice, Sub-Saharan Africa

Introduction

Medical photography has become an essential tool in medicine since the 19th century and its application has transcended every specialty of the practice.[1] Medical photographs are valuable adjuncts that can express much more of the patient's story from diagnosis through disease progression to eventual treatment outcome.[2] Likewise, good-quality photographs are invaluable tools in all subspecialties of ophthalmology.[2] The term photodocumentation was coined because photographs allow documentation, which is superior to that of words alone, with no wonder the old saying "a picture is worth more than a thousand words."

Ophthalmic photography is a specialized form of medical imaging used for the study of ocular disorders.[2] Through the use of state-of-the-art equipment, its use has led to the improved documentation and understanding of ocular structures as well as pathologic processes. Ophthalmic photography covers a very broad scope of eye imaging techniques that include external ocular photography (EOP), corneal topography, and endothelial cell-layer photography for the anterior segment structures of the eye. The posterior segment imaging modalities of the eye include optical coherence tomography, color fundus (retinal) photography, fluorescein angiography, indocyanine green angiography, fundus autofluorescence, and optic nerve head analysis. Of all the imaging modalities in ophthalmic practice, EOP is the least reliant on sophisticated instrumentation and can be

Address for correspondence: Dr. Oluwatobi Olalekan Idowu, 10 Koret Way, Rm K201, San Francisco, CA 94143, USA.
E-mail: Oluwatobi.idowu@ucsf.edu

Access this article online

Quick Response Code:

Website: www.nigerianjournalofophthalmology.com

DOI: 10.4103/njo.njo_31_17

How to cite this article: Aribaba OT, Idowu OO, Musa KO, Abikoye TM, Onyekwelu OM, Onakoya AO, Akinsola FB. Practice of external ocular photography among ophthalmologists in Nigeria, sub-saharan Africa. Niger J Ophthalmol 2018;26:56-61.

employed in resource-poor settings such as Nigeria. EOP entails the imaging of the external eye, ocular adnexa, face, and sometimes the anterior segment. It is helpful in patient communication, surgical/treatment plan, teaching, research/publication, medicolegal purposes, social marketing, and advertisement.[3-5] In addition, it is often required by insurance companies for procedure preauthorization and reimbursement purposes, especially in developed countries.[6] Therefore, clinical photograph is an invaluable tool in eye care services.

Ideally, clinical photographs are best taken with digital camera, which can also be incorporated into slit-lamp bio-microscope for anterior and posterior segments imaging with easy capturing, processing, and documentation using an adapter.[7,8] However, the availability of mobile phone and tablet cameras makes these devices a makeshift in clinical photography, especially in environments that lack infrastructure for advanced imaging modalities. Previous studies have reported the application of these devices in screening for the retina manifestations of systemic diseases[9-11] as well as the Global Trachoma Mapping projects[12-14] in Nigeria. Invariably, as more physicians own and use mobile phones, the use of these devices for clinical photograph is expected to increase. Nevertheless, this is not without its sheer technical shortcomings and ethical acceptability that can emanate from information sharing as well as storage, as photodocumentation is part of patient identifier.

To the best of the authors' knowledge, no prior studies have evaluated the practice of EOP among ophthalmologists in Sub-Saharan Africa. Given the importance of clinical photography and the rise in its application in ophthalmic practice, this study sought to assess the practice of EOP among ophthalmologists in Nigeria with a view to providing baseline information that will be useful in the advancement of ophthalmic practice.

Materials and Methods

This was an online cross-sectional survey in which all practicing ophthalmologists in Nigeria listed in the databases of the Ophthalmological Society of Nigeria, the National Postgraduate College of Nigeria, and the West African College of Surgeons were invited to participate via email. Ethical clearance was obtained from the Health Research and Ethics Committee of the Lagos University Teaching Hospital, Lagos, Nigeria.

The survey was distributed via emails using Qualtrics software (Qualtrics, Provo, UT) for a period of 10 weeks (March 24, 2017 to June 2, 2017). Participants were made to understand that they would be providing informed consent by completing the survey, and all answers would be confidential. Telephone calls and reminder emails were sent to non-responders every week after the initial email until May 31, 2017 to maximize the response rate. The online questionnaire could only be submitted once per person and the design of the study allowed the research team to identify non-responders and contact them by telephone. After the submission of the questionnaire, the identification codes were destroyed, thereby maintaining total anonymity for all participants. Information regarding the type of practice, location of practice, years of practice, subspecialization, reasons for external photography, type of camera, ownership of camera, and barriers to external photography were obtained. Furthermore, legal and ethical awareness regarding photography as well as its practices were also assessed.

Statistical analysis was performed using IBM Statistical Package for the Social Sciences version 22.0 software for Windows (IBM Corp., Armonk, NY). Descriptive statistics were reported using means and standard deviations for normally distributed data, and medians and interquartile range for data not meeting this assumption. Pearson's Chi-square test was used to evaluate associations between demographic variables and item responses, whereas the associations between continuous variables were analyzed using independent *t*-test. A *P*-value of <0.05 was considered statistically significant.

Results

A total of 183 out of 355 ophthalmologists completed the online survey accounting for a response rate of 51.5%. The mean age of respondents was 43.9 ± 8.1 years (range 31–68 years), and majority (41.5%) of the respondents were in the age range of 31–40 years. There was a slight male preponderance in this study with 50.8% being male participants. Eighty (43.7%) respondents practice in the south-west zone of Nigeria, whereas 117 (63.9%) work in government tertiary hospitals as shown in Table 1. The number of years in practice since qualification ranged from 1 to 37 years with a mean of 12.5 ± 8.5 years. Ninety-three (50.8%) ophthalmologists have undergone subspecialty training after qualification.

One hundred and fifty-five (84.7%) respondents use EOP in their practice. Table 2 illustrates the pattern of EOP among respondents. One hundred and forty-one (91.0%) use smartphones (android/iPhone), whereas 36 (23.2%) use slit-lamp bio-microscope camera for capturing images. One hundred and forty-eight (95.5%) respondents use personal camera for EOP, whereas 46 (29.7%) make the use of institution camera. Regarding who takes photographs, consultant ophthalmologists accounted for 131 (84.5%), whereas medical photographers accounted for 9 (5.8%) as shown in Table 2. There was no significant difference between the mean age of those who took EOP and those who did not ($t = -0.2969$; 95%CI: −3.912 to 2.912; $P = 0.3834$). There was no statistically significant association between the use of EOP and other demographic variables (years in practice, type of practice, subspecialty training, and geopolitical zone of practice).

The most frequent indication for EOP was for documentation reported by 110 (71.0%) respondents. This was followed

Table 1: Demographic and practice characteristics of respondents

Characteristics	Frequency	Percentage (%)
Age (years)		
31–40	76	41.5
41–50	66	36.1
51–60	35	19.1
61–70	6	3.3
Total	183	100.0
Gender		
Male	93	50.8
Female	90	49.2
Total	183	100.0
Location of practice		
North-east	10	5.5
North-west	18	9.8
North-central	24	13.1
South-east	17	9.3
South-west	80	43.7
South-south	34	18.6
Total	183	100.0
Type of practice		
Individual private practice	19	10.4
Group private practice	15	8.2
Military hospital	1	0.6
Mission hospital/clinic	16	8.7
Government – secondary	15	8.2
Government – tertiary	117	63.9
Total	183	100.0

Table 2: Pattern of external ocular photography among 155 respondents

	Frequency (n = 155)	Percentage (%)
Type of camera*		
Smartphones (Android/iPhone)	141	91.0
Digital camera	52	33.5
Slit-lamp biomicroscope camera	36	23.2
Tablet/iPad	34	21.9
Ownership of camera*		
Department/institution	46	29.7
Personal	148	95.5
Who takes external ocular photographs?*		
Consultants	131	84.5
Residents	85	54.8
Trained technicians	15	9.7
Ophthalmic nurses	11	7.1
Medical photographers	9	5.8

*Some respondents gave multiple responses.

by teaching/educational purposes (54.2%), patient's communication (47.1%), treatment/surgical planning (45.8%), and research/publication purposes (45.2%) as shown in Table 3. Reasons for not undertaking clinical photography are listed in Table 4. The most stated barriers

Table 3: Indications for external ocular photography among 155 respondents

Indications*	Frequency (n = 155)	Percentage (%)
Documentation	110	71.0
Teaching/educational purpose	84	54.2
Patient's communication	73	47.1
Treatment/surgical planning	71	45.8
Research/publication	70	45.2
Medico-legal reasons	56	36.1
Tele-ophthalmology	21	13.5
Social marketing	9	5.8
Advertisement	5	3.2

*Some respondents gave multiple responses.

Table 4: Reasons for not undertaking EOP among 28 non-users

Reasons*	Frequency (n = 28)	Percentage (%)
Not perceived need/demand	14	50.0
Lack of camera	7	25.0
Lack of storage facility	6	21.4
Lack of medical photographer	5	17.9
Lack of remuneration	2	7.1
Have no interest in photographs	1	3.6
Too time consuming	1	3.6

*Some respondents gave multiple responses.

to the use of EOP were: no perceived need or demand, lack of storage facility, lack of camera, and lack of medical photographers.

The responses of EOP users concerning ethicolegal issues are summarized in Table 5. Among the 155 users of EOP, 109 respondents lacked storage facility. Out of the 46 respondents who had storage facility, 32 (69.6%) usually stored the photographs in personal computers separate from patients' records. One hundred and thirty-five (87.1%) EOP users took consent and/or assent from patients. Of these 135, only 7 (5.2%) obtained written informed consent from the patients with majority (94.8%) relying on verbal consent. One hundred and seventeen (75.5%) EOP users were aware of ethical and legal issues in clinical photography with consent (96.6%), paper publishing (67.5%), as well as electronic publishing (53.0%) being the most issues of concern.

There was a statistically significant difference (t (155) = –2.825, P = 0.005) in years of practice between respondents who usually obtained consent (mean =11.52 ± 7.55) and those who did not obtain consent (mean =16.95 ± 11.05) for EOP. Those who obtained consent for EOP were younger in practice than those who did not obtain consent for EOP. However, there was no significant association between obtaining consent and other

Table 5: Ethical and legal practices for EOP among respondents

Variable	Frequency	Percentage (%)
Do you consent for EOP?		
Yes	135	87.1
No	20	12.9
Total	155	100.0
Type of consent		
Verbal consent	128	94.8
Written informed consent	7	5.2
Total	135	100.0
Are you aware of legal and ethical issues in clinical photography?		
Yes	117	75.5
No	38	24.5
Total	155	100.0
Which legal and ethical issues are you aware of in clinical photography?* (n = 117)		
Consent	113	96.6
Paper publishing	79	67.5
Electronic publishing	62	53.0
Copyright	60	51.3
Editing and storage	27	23.1
Do you have designated storage facility for external ocular photographs?		
Yes	46	29.7
No	109	70.3
Total	155	100.0
Type of storage facility* (n = 46)		
Personal computer/laptop	32	69.6
Cloud	21	45.7
Hospital/institutional computer	20	43.5
External drive	7	15.2

*Some respondents gave multiple responses.

demographic variables (type of practice, subspecialty training, and geopolitical zone of practice).

Discussion

The response rate of 51.5% for this study was lower than the overall response obtained by Kyari *et al.* (61%)[15] who combined the web-based, phone, and in-person survey methods of questionnaire administration among Nigerian ophthalmologists, although the exact number of respondents who completed the web-based survey in their study was not stated. This reflects the growing acceptance of web-based/online survey in developing countries as obtained in advanced countries due to the transcending effect and accessibility to internet services.

There is high proportion (84.7%) of EOP use in this study, and smartphone cameras predominate as the most common type of camera being used for image acquisition. This is higher than 48% use of clinical photographs reported among general dental practitioners in UK.[16] This may be attributed to the use of purely digital camera for clinical photographs in their study compared to 91.0% of the users who capture images with smartphone cameras. The application of smartphones for clinical photography may not be unrelated to its ubiquitous presence, ease of use, and easy mobile access to information. These advantages help physicians reduce the potential risk of loss of patient's information associated with the use of multiple devices. Nonetheless, the technical shortcomings of smartphone cameras for good quality photographs, which include poor resolution as well as distortion induced by the lens and illumination issues, cannot be downplayed.[17]

In this study, there was preponderance of the use of personal camera in the form of smartphone (n = 141; 91.0%) and/or digital cameras (n = 52; 33.5%) for clinical photography. This was comparable to 71.4% reported by McG Taylor *et al.*[18] among the plastic surgeons. However, Adeyemo *et al.*[4] reported low acceptance of personal camera (28%) or smartphone camera (22%) for medical photography among Nigerian maxillofacial patients. Similarly, Hsieh *et al.*[19] found only 27% of the patients agreeing to the use of personal camera for acquisition of clinical photography. The low level of acceptance of personal camera and smartphone camera by patients in the aforementioned reports may be attributed to the potential breach of privacy as well as confidentiality that can occur from using these devices. This was corroborated by the findings of Lau *et al.*[20] wherein most patients preferred the use of non-identifiable photographs for all purposes by their physicians. Although patients preference for institutional/hospital owned camera is well documented in literatures,[4,19,20] the use of personal camera and phone camera by clinicians should be well guided by institutional policy, especially in resource-limited environment for maximal benefits. Furthermore, respondents reported that consultant ophthalmologists (84.5%) and trainee ophthalmologists (54.8%) were predominantly responsible for taking photographs in their centers. Likewise, McG Taylor *et al*. reported that over 70% clinicians were taking clinical photographs of patients themselves.[18] This mirrors the perception of patients as reported by Adeyemo *et al.*[4] that they preferred their attending doctors take the photographs because they are confident that their privacy and confidentiality are better protected with doctors. Thus, all health professionals involved in medical photography should be aware of their professional responsibility to regard all photographs taken as being confidential.

The most common indications for EOP in this study were documentation, teaching/educational purposes, patient's communication, surgical/treatment planning, and research/publication purposes. These are in conformity with the uses of clinical photography documented in literatures.[2,4,16] It is worthy of note that medicolegal reasons are not one of the top indications for acquisition and usage of clinical photographs in this study. However, with growing need to protect the right of patients accessing healthcare induced by rise in the number of litigations, this indication may increase with time. The barriers to the use of EOP among ophthalmologists in this study were: no perceived need or demand, lack of storage

facility, lack of camera, and lack of medical photographers. This is in accord with the findings of Morse *et al*.[16] The use of clinical photographs in ophthalmic practice may be improved with dedicated sessions for clinical photographs at postgraduate courses as well as during annual societal meetings.

The ethical and legal aspect of clinical photography keeps evolving with much debate in developed countries regarding appropriate guidelines for its practice. In this study, 76% of the respondents using EOP were aware of the legal and ethical issues in clinical photography. Informed consent (96.6%) and paper publishing (67.5%) were the most common concerns identified among these respondents. Although there is a high level of consent-seeking attitude for EOP in this study, the use of written informed consent is poor. This finding is similar to the observation in a survey conducted among plastic surgeons in the United Kingdom wherein verbal consent is the most common form of consent.[18] However, clinicians should note that although verbal discussion may form the basis of consent process, it may not be sufficient as clinical photographs and its associated risks exist in a dynamic environment. Similarly, in a study by Adeyemo *et al*.,[4] 78% of the patients indicated that their consent should be sought for medical photography needs. Hence, detailed consent should be obtained prior to any photography stating its three levels: first, that images are for medical record; second, it can be used for educational purposes; and third, it can be used for publications.[18] In addition, the current international standard for medical publishing requires authors to obtain informed consent and in the absence of consent, identifiable pictures should be omitted.[4] An association between obtaining consent and short duration in practice was observed in this study. One possible explanation for this finding is the rise in awareness of this practice among recent graduates compared to older graduates when consent for clinical photography was a gray area. Moreover, despite submission of photographs for publishing among respondents, there is poor knowledge on the copyright of these images. This may pose publication challenge for authors declining transfer of copyright, as photographs are part of patient's medical record that are owned by the institution.

Photograph/image storage and security in this study is poor, as 70.3% of the EOP users had no storage facility and 69.6% stored images on personal computer/laptop. The attendant problem of loss or theft associated with this device raises concerns for the possible breach of patient's privacy and confidentiality. Although there are no regulations guiding acquisition and storage of clinical photographs in our setting presently, it is important to realize that patient fears of unwanted dissemination of their images are valid and warrant consideration.[3,4,21,22] Therefore, it is recommended that photographs should be safely and securely stored in password-protected devices of the hospital.

Notwithstanding the significant findings of our study, the differential access to internet across the country with implications of average response rate is a limitation of this study.

Conclusion

The use of EOP is well embraced by ophthalmologists in Nigeria in this survey with smartphones being the most popular. The affordability and accessibility of smartphones camera possibly makes them a convenient option for EOP in Nigeria and Sub-Saharan Africa. The ability to have smartphones in an eye care institutions in Sub-Saharan Africa presents a major boost to patient care and also assist clinicians in education, research, and information sharing. However, there is need for more consideration for ethical and legal principles guiding the practice of clinical photography. The importance of a policy on the use of ophthalmic photographs, storage, retrieval, and its medicolegal implication cannot be overemphasized.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Prasad S, Roy B. Digital photography in medicine. J Postgrad Med 2003;49:332-6.
2. Mukherjee B, Nair AG. Principles and practice of external digital photography in ophthalmology. Indian J Ophthalmol 2012;60:119-25.
3. Bhattacharya S. Clinical photography and our responsibilities. Indian J Plast Surg 2014;47:277-80.
4. Adeyemo WL, Mofikoya BO, Akadiri OA, James O, Fashina AA. Acceptance and perception of Nigerian patients to medical photography. Dev World Bioeth 2013;13:105-10.
5. Harting MT, DeWees JM, Vela KM, Khirallah RT. Medical photography: Current technology, evolving issues and legal perspectives. Int J Clin Pract 2015;69:401-9.
6. Brown MS, Jindal V, Rubin PA. Digital photography for the ophthalmic plastic surgeon. Ophthal Plast Reconstr Surg 2001;17: 151-3.
7. Lee WW. Slit Lamp Adapters Turn Smartphones into Clinical Cameras. Ophthalmology Web. Available from: http://www.ophthalmologyweb.com/Featured-Articles/136817-Slit-Lamp-Adapters-turn-Smartphones-into-Clinical-Cameras/. [Last accessed on2017 Oct 30].
8. Patalano SM, Salehi-Had H, Patalano VJ. Low cost digital photography of anterior and posterior segments. J Cataract Refract Surg 2010;36: 1051-3.
9. Oluleye TS, Rotimi-Samuel A, Akinsola FB, Adefule-Ositelu OA, Onakoya OA, Aribaba OT, *et al.* Mobile phones for diabetic retinopathy screening in poor resource setting of Nigeria, Sub-Saharan Africa. Niger J Ophthalmol 2015;22:S10-11.
10. Oluleye TS, Rotimi-Samuel A, Adenekan OA. Mobile phones for retinopathy of prematurity screening in Lagos, Nigeria, Sub-Saharan Africa. Eur J Ophthalmol 2016;26:92-4.
11. Ademola-Popoola DS, Olatunji VA. Retinal imaging with smartphone. Niger J Clin Pract 2017;20:341-5.
12. Adamu MD, Mpyet C, Muhammad N, Umar MM, Muazu H, Olamiju F, *et al.* Prevalence of trachoma in Niger state, North

Central Nigeria: Results of 25 population-based prevalence surveys carried out with the Global Trachoma Mapping project. Ophthalmic Epidemiol 2016; 23(Suppl 1):63-9.
13. Mpyet C, Muhammad N, Adamu MD, Muazu H, Umar MM, Alada J, *et al.* Trachoma mapping in Gombe state, Nigeria: Results of 11 local government area surveys. Ophthalmic Epidemiol 2016;23:406-11.
14. Muhammad N, Mpyet C, Adamu MD, William A, Umar MM, Goyol M, *et al.* Mapping trachoma in Kaduna state, Nigeria: Results of 23 local government area-level, population-based prevalence surveys. Ophthalmic Epidemiol 2016; 23(Suppl 1):46–54.
15. Kyari F, Nolan W, Gilbert C. Ophthalmologists' practice patterns and challenges in achieving optimal management for glaucoma in Nigeria: Results from a nationwide survey. BMJ Open 2016;6:e012230.
16. Morse GA, Haque MS, Sharland MR, Burke FJ. The use of clinical photography by UK general dental practitioners. Br Dent J 2010; 208: E1; discussion 14-5.
17. Ashique KT, Kaliyadan F, Aurangabadkar SJ. Clinical photography in dermatology using smartphones: An overview. Indian Dermatol Online J 2015;6:158-63.
18. McG Taylor D, Foster E, Dunkin CS, Fitzgerald AM. A study of the personal use of digital photography within plastic surgery. J Plast Reconstr Aesthet Surg 2008;61:37-40.
19. Hsieh C, Yun D, Bhatia AC, Hsu JT, Ruiz de Luzuriaga AM. Patient perception on the usage of smartphones for medical photography and for reference in dermatology. Dermatol Surg 2015;41:149-54.
20. Lau CK, Schumacher HH, Irwin MS. Patients' perception of medical photography. J Plast Reconstr Aesthet Surg 2010;63:e507-11.
21. Hood CA, Hope T, Dove P. Videos, photographs, and patient consent. BMJ 1998;316:1009-11.
22. Supe A. Ethical considerations in medical photography. Issues Med Ethics 2003;11:83-4.