

Use of Smartphones and Its Perception in the Recording and Distribution of Medical Images among Dental Practitioners

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ABSTRACT

Objective: The need for prompt acquisition and distribution of data and information is a rapidly developing industry. Smartphones has played a huge role in this aspect, and it has rapidly evolved in the medical profession. This has the capacity to improve health care, but comes with specific ethical and medico-legal considerations that include issues of confidentiality, privacy and policy control. The objective of the study was to quantitatively assess the use of smartphones in a clinical setting along with their perception regarding policies, practice and patient care.

Methods: A descriptive cross-sectional study design was utilized for the study among dental surgeon in the University of Benin Teaching hospital, Benin City, Edo State, Nigeria. Data was collected using a semi-administered questionnaire and was tabulated and analyzed using the statistical package for IBM SPSS version 24.0 and quantitative tables were expressed as frequencies and percentages.

Results: Forty-six responses were received. Most respondents were from the Oral surgery discipline, followed by Paedodontics, then Restorative dentistry. Ninety-seven percent admitted to taking medical images on their smartphones, yet no consent as obtained in almost a quarter (19.6%). When consent was taken, it was predominantly verbal, but only documented 32.6% of the time. Of those who took medical images, 97.8% stored them in the personal device and 77.8% shared identifiable images with someone else, mostly for input from another clinician. About six percent were aware that an institutional policy existed, but none had read the policy.

Conclusion: Dental surgery is a highly visual field in which practice is complemented by the use of photographic images for patient care and educational purposes. Among Dental surgeons, personal smartphones are regularly being used to photograph the clinical state of a patient. Whilst the use of smartphones in a hospital setting is inevitable, the results obtained highlight issues related to privacy, confidentiality and patient care. This study will enable discussion and formulation of an evidence-based hospital policy.

Keywords: Data, Smartphones, Dissemination, Photography

INTRODUCTION

Advancements in technology have always had major impacts on medicine. The smartphone is one of the most ubiquitous and dynamic trends in communication, in which one's mobile phone can also be used for communicating via email, performing Internet searches, and using specific applications. The smartphone is one of the fastest-growing sectors in the technology industry, and its impact on medicine has already been significant. Smartphones offer an attractive possibility to solve problems of accessibility, quality, effectiveness, efficiency, and costs of health care (Cleland *et al.*, 2013). The ultimate aim of capturing, storing, and sharing clinical photographs should be, to improve the outcome and bring about a better prognosis for the individual patient (McDonald., 2012). Part of a dental surgeon's task is to help patients understand their diseases, and photography plays a vital role in this regard. Intraoperative images are shared with patients to better illustrate the findings and future course of an operation while preoperative and postoperative images document patient progress (Siegmond *et al.*, 2008; McDonald., 2012). The advancement in smartphones technology has evolved to the point that they now routinely integrate a digital camera of an acceptable clinical quality, capable of capturing medical images. The introduction of email services, Multimedia Messaging (MMS), and social networking have enabled a quick and simple method of media distribution (Kirk *et al.*, 2014). This rapid evolution of technology creates the potential to enhance the clinical care of patients within a hospital environment but also brings with it, issues of confidentiality, privacy, and policy control (Gilson & Green., 1984).

The principles and policies of using smartphones are no different from using a film or digital camera (Zheng., 2006). Most health care organizations have policies that address the safe collection of such images. However, these policies now need to address electronic issues such as evidence of signed informed consent, strong encryption of transmitted data with authenticated access, delineation of specific intended use(s), and secure method of storage (Mahar *et al.*, 2013). Although there is some evidence regarding Doctors' use of smartphones in medical facilities in developed countries, there is little research on how they have used smartphones to support records and dissemination of medical images and how this relates to medical performance. The use of software and hardware architecture in smartphones to improve health care is an emerging issue that allows the implementation of various technologies associated with telemedicine on a phone including lens-less microscopy on a chip, electrical impedance tomography, fluorescence microscopy,

electrocardiography, etc. (Derbyshire & Burgess., 2006).

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On the ground of medico-legal reasons, where this photography could serve greater purposes, this study considered the amount of time Dental Surgeons used smartphones in the University of Benin Teaching Hospital and explored how it influenced their diagnostic process and the roles of Smartphone photography in the recording and disseminating medical images. This study aimed to assess the roles of smartphones in the recording and dissemination of medical images amongst Dental Surgeons at the University of Benin Teaching Hospital.

MATERIALS AND METHODS

A cross-sectional study was conducted among Dental Surgeons at the University of Benin Teaching Hospital, Benin City, Nigeria. Approval was obtained from the Ethics and Research Committee of the hospital. The study population comprised the Dental house officers, Dental officers, Resident doctors, and consultants present in the Dental clinic at the University of Benin Teaching Hospital, Benin City, Nigeria.

Data were obtained using a self-administered questionnaire following pretesting. The data collected were tabulated and analyzed using the IBM SPSS version 24. Frequency tables were generated. The chi-square test was used to detect statistically significant differences between two groups of any categorical variables under consideration. In all analyses, the statistical significance level was set at $P < 0.05$.

RESULTS

A total of forty-six participants were included in the study. The age of participants varied from 20 to 60 years, with a mean age of 32.6 ± 6 years. Just over two-thirds (71.7%) were between 31 and 40 years of age. A total of 60% of the participants were male. About two-thirds (69.5%) of the participants were Registrars and 21.7% were house officers (Table 1). On the Self-reported cases on Mobile phone characteristics, all of the participants reported having a mobile phone with the presence of a camera and access to the internet, and nearly all the participants used their personal mobile phone for clinical photographs as the health care administration did not provide camera for this purpose.

On the Self-reported cases on medical smartphone photography imaging, about 97.8% of the participants have taken medical images in a clinical setting on a mobile device at UBTH, while 80.4% of the participants sought consent from their patients, about 32.6% of the

participants documented the images in the patient's medical record, 41.3% of the participants delete medical images that have been taken by them within UBTH, about 97.8% of the participants store images taken. On the evaluation of the number of participants

who seek consent before carrying out medical imaging, about 80.4% of the participants sought consent from the patient routinely while about 19.6% of them did not. (Figure 2)

Table 1: Socio-demographic characteristics of the participants

Variable	Frequency (n)	Percent (%)
Age (Years)		
20 – 30	8	17.4
31 – 40	33	71.7
41 – 50	4	8.7
51 – 60	1	2.2
Sex		
Male	27	60
Female	18	40
Position		
House officer	10	21.7
Dental Officer	1	2.2
Registrar	32	69.5
Consultant	3	6.5
Department		
Oral and Maxillofacial Surgery	9	19.6
Restorative Dentistry	6	13.0
Paedodontics	8	17.4
Orthodontics	4	8.7
Community Dentistry	4	8.7
Oral Pathology	3	6.5
Oral Medicine	4	8.7
Oral Diagnosis and Radiology	5	10.9
Periodontics	3	6.5

Further reports on smartphone use and governance, only 6.7% of the participants knew UBTH has a policy regarding medical image photography, but it about one tenth (10.9%) of the participants that have read the policy regarding the use of smartphones in healthcare, while all the participants believed the use of clinical photographs and particularly smartphone images aids

in the provision of patient care, Perception regarding the ownership of medical images, 65.2% of the participants believed that the hospital owns any medical images taken within UBTH. while roughly same respondents believed that it belongs to either the patient or the doctor. (Table 2)

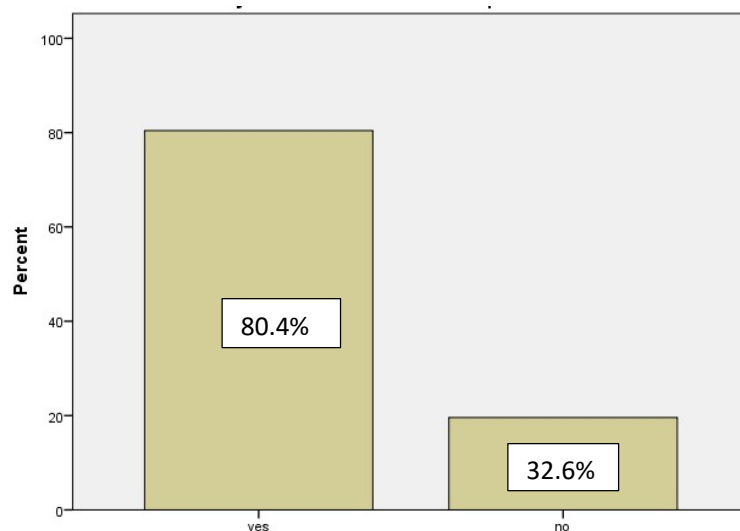


Figure 1: Consent from the patient

Table 2; Self-reported cases on smartphone use and governance

Variable/Frequency	Yes (%)	No (%)
Do you know if UBTH has a policy regarding medical image photography	6.7	93.3
Have you ever read a policy regarding the use of smartphones in healthcare	10.9	89.1
Do you believe the use of clinical photographs and particularly smartphone images aids in the provision of patient care	100.0	0.0
Who do you believe owns any medical images taken within UBTH	Patient 15.2	Doctor 19.6 hospital 65.2

DISCUSSION

Any image that captures a patient's condition constitutes part of his or her medical record and, as such, should be held to the same standards of confidentiality and consent to disclosure as any written or dictated record (Felt et al., 2011). Clinical photography, whether using a standard camera or a personal smartphone, is an integral part of the practice of Dental surgery. Smartphones are ubiquitous and many clinicians utilize the clinical tools on their smartphones in the context of patient care (Shivlal, 2014). Although using a smartphone as a camera is prevalent in the University of Benin Dental Clinic, majority (97.8%) of the studied dental surgeons have taken medical images with their smartphone camera. The discomfort around the use of personal smartphones revolves around the uncertainty with privacy and confidentiality issues, the existence of any regulation or guidelines regarding smartphones, and the overall appearance of professionalism and acceptance by patients. However, even with such uncertainties, it is not enough of a deterrent to prevent the employment of smartphones for clinical photography.

Images taken and retained on smartphones carry a high risk of compromising patient confidentiality. Often, these images are stored in the same location that personal images are stored, which also provides ample opportunity for confidential images to surface during a casual conversation that is unrelated to patient care, a practice clearly at odds with ethical conduct (Bengel, 1985). With the current prevalence of the practice of using smartphones as clinical cameras, the issues of proper clinical image storage on smartphones must be resolved and an alternative to smartphone must be explored.

Although there is significant concern that the storage of clinical photos on a personal device increases the ease of distribution of photographs to the public domain (Gilson et al., 1984), some of our participants perceived smartphones as a more secure mode of clinical photography. They believed that, unlike cameras, smartphones can be password protected with about 88.6% of the participants having passworded their smartphones. Social media served as a high means of sharing medical images as a high number of the participants constituting about 71.4% shared identifiable images via social media, this can be

encrypted and managed remotely since a standard camera can be as easily lost or stolen.

In a review of current guidelines and policy of digital imaging at the University of Benin, a huge number of participants (93.3%) were not aware of any policy regarding the use of smartphones in the health facility. The majority of research participants were in agreement that it is crucial to obtain the patient's consent before taking any medical photographs and it is important that the hospital should have the appropriate technology to effectively use the images safely and only after the patient has given their written consent.

Another of the concerns brought forward by the comments provided in the present survey involved participants' perception of the ownership of the various medical images, this shows the poor knowledge regarding the hospital policy.

CONCLUSION

Dental surgery is a highly visual field in which practice is complemented by the use of photographic images for patient care and educational purposes. Among Dental surgeons, personal smartphones are regularly being used to photograph the clinical state of a patient. Whilst the use of smartphones in a hospital setting is inevitable, the results obtained highlight issues related to privacy, confidentiality, and patient care. This study will enable discussion and formulation of an evidence-based hospital policy. The present study demonstrated that regardless of reservations or concerns, Dental surgeons still feel compelled to use personal smartphones in this fashion. Given the ubiquity of smartphones, further guidelines and regulations prohibiting smartphone use for patient photography are not feasible.

Nevertheless, should smartphones be used for patient photography? Yes. Smartphones are convenient and can offer security and safety of patient data

RECOMMENDATIONS

The various issues that need to be addressed and improved upon include; the poor understanding of hospital policy, more orientation, and enlightenment on the true ownership of the medical images, and the provision of smartphones by various health facilities, other than the doctor's device.

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