



The use of digital dental photography in an Eastern European country

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Abstract

Aims. To assess the use of digital photography in dentistry and its relation with the professional experience of the dental practitioners in Romania.

Methods. An anonymous questionnaire including eight questions was distributed online to collect information on the use of dental photography.

Results. 84.84% of the respondents were using a photographic equipment in their clinical practice. Regarding the type of photographic equipment used, 51.79% of the participants indicated DSLR cameras, 44.05% smartphones, 2.38% compact cameras and 1.78% other devices for taking clinical images. There was a significant association ($p < 0.05$) between the experience of the practitioners and the use of dental photography, type of equipment and protocol used.

Conclusions. Respondents with more than 10 years of experience were more likely to use digital photography in their practice than those with less experience. Most of the digital photography users with more than 10 years of experience were taking images with a DSLR Camera (65.52%) followed by 31.04% smartphone users. Conversely, 56.42% of the clinical photography users with less than 5 years of experience mainly preferred a smartphone device and 41.02% a DSLR Camera.

Keywords: smartphone, DSLR cameras, dental photography, dentists, surveys and questionnaires, Romania

Introduction

In the digital era of dentistry, clinical photography has become a standard procedure in daily practice [1,2,3]. The treatment plan can be improved due to the use of clinical images together with other information, which are distributed among the members of the medical team almost instantly, through devices connected to the internet.

Constant technical progress providing simplified photographic equipment and refined protocols for the multidisciplinary cases determined the widespread distribution of clinical photography in dentistry.

The limits of conventional (analog) photography have been overcome by the development of digital photography. Currently, obtaining

digital photographs is considered more accessible for the dental practitioners since several devices are capable of capturing images of the clinical situation [4].

After many years of updates, the set-up consisting of DSLR (digital single lens reflex) body, macro lens (magnification ratio 1:1, focal length between 60 and 105 mm) and an external source of light (ring flash or twin flash) still remains the golden standard in terms of photographic equipment used in dentistry [1,4,5,6]. However, some attempts have been made by manufacturers to simplify and make more user-friendly the photographic equipment. Such is the case of the compact camera Eye Special C-IV (Shofu Dental GmbH, Ratingen, Germany) developed exclusively for dentistry, which includes several features

DOI: 10.15386/mpr-2119

Manuscript received: 19.03.2021

Accepted: 07.07.2021

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(ergonomic compact design, low weight, close-up lens, smooth surface easy to disinfect or a cross polarization filter included) aiming to reduce the learning curve for dental photography [7].

Smartphones featuring constant technical development used together with the portable device Smile Lite Mobile Dental Photography (Smile Line, St-Imier, Switzerland) represents a photographic instrument for documentation and communication in dental medicine. High quality images can be taken using this simple and easy smartphone-based system [8,9].

Standard views of the patient were introduced in practice to establish an easy-to-follow protocol which can provide reliable images and hence a more predictable result [1,4,10].

The usage of digital photography in clinical dentistry allows the practitioner to accomplish three main purposes: documentation, communication and marketing [11].

The initial photographic documentation represents the starting point for the following steps of a dental treatment: examination, diagnosis, planning, progress, monitoring or outcomes. Considered as a powerful diagnostic tool, the digital photography can provide information easy to analyze without the presence of the patient [2,12].

An efficient communication with the patient, dental technician, members of the staff, audience (when lecturing), or specialists can be acquired through digital imaging. The predictable results in prosthetic dentistry can be sustained by high quality photography provided to the dental technician [13]. Initial or try-in images with the case includes essential information about color, shape or relation of the restorations with the adjacent soft and hard tissues [6].

The set-ups displaying before and after cases or educational images are considered mandatory for the current marketing purposes [13].

The aim of this study was to assess the use of digital photography in dentistry and its relation with the work experience of the dental practitioners in Romania. In addition, factors such as the technical characteristics of the equipment used, clinical protocol followed, perception regarding the benefit of dental photography in the communication with the patient and dental laboratory have been investigated. The null hypothesis was that no relation existed between the practitioner's experience and the: a) use of digital photography in dental practice, b) photographic equipment used, c) photographic protocol followed, d) use of clinical images to communicate with the dental technician.

Methods

An anonymous survey was conducted to collect information on the use of dental photography among dental practitioners in Romania. The online questionnaire including eight questions (Table I), and was distributed via Google Forms (Alphabet Co., Mountain View, CA, USA) in the interval June-September 2020 using Yahoo Mail and Facebook media platforms.

The data analysis was performed using statistical software (SPSS Statistics v.27, IBM, Chicago, IL, USA) providing descriptive statistics and percentage distributions of the responses. A Chi-Square test of independence with a significant level of 0.05 was used to verify association between categorical variables. The post hoc analysis was performed using the adjusted standardized residuals (ASR) with a z critical value of 1.96.

Table I. The questionnaire of the study.

Question	Answer
1. What is your experience in practicing dentistry?	Less than 5 years / 5-10 years / More than 10 years
2. Do you use photographic equipment in your dental practice?	Yes / No
(*if the answer for question 2 is yes):	
3*. What type of photographic equipment do you use?	DSLR Camera / Smartphone / Compact cameras / Others
4*. Do you use clinical images to communicate with the dental technician?	Yes / No
5*. Do you follow a protocol when taking clinical images?	Yes / No
6. Do you consider that the use of photographic equipment in dental office brings a benefit concerning the communication with the patient?	Yes / No / I don't know
7. Do you consider that the use of photographic equipment in dental office brings a benefit in the workflow/ quality of the results for the practitioner	Yes / No / I don't know
8. Do you think that clinical images facilitate the communication with the dental technician?	Yes / No / I don't know

Results

The answers given by the 198 participants who filled the questionnaire are summarized in table II.

Based on the answers to question 1 (years of experience in dentistry) the respondents were divided into 3 groups: A (n=104) with less than 5 years of experience, B (n=36) with experience between 5 and 10 years and C (n=58) with more than 10 years of experience in the dental field (Table II).

From the 198 surveyed participants, 84.84% (n=168) were using a photographic equipment in their practice vs. 15.16% (n=30) who were not using such methods.

The use of clinical photography and the experience in dentistry were significantly associated ($p < 0.05$) (Table IIIA). In group C (experienced practitioners), the observed frequency was greater than the expected one (observed value=58; ASR=3.8) indicating that they are more likely to use clinical photography than those from Group A and B.

Regarding the type of photographic equipment used overall, 51.79% of the participants have been indicated DSLR cameras, 44.05% smartphones, 2.38% compact cameras and 1.78% other devices for taking clinical images (Figure 1). When performing the Chi-square test for the type of the photographic equipment used, the subjects which responded compact camera or others were not included in the analysis because they did not fulfill the requirements of validity for this type of statistical test (50% of the cells would have the expected count less than 5).

A significant relationship was found between the type of photographic equipment (DSLR camera or Smartphone) used and the experience in dentistry ($p < 0.05$) (Table IIIB), the practitioners from group C being more likely to use a DSLR camera (observed value=38, ASR=2.6) while

the practitioners from group A were more likely to use a smartphone device (observed value=44, ASR=2.9).

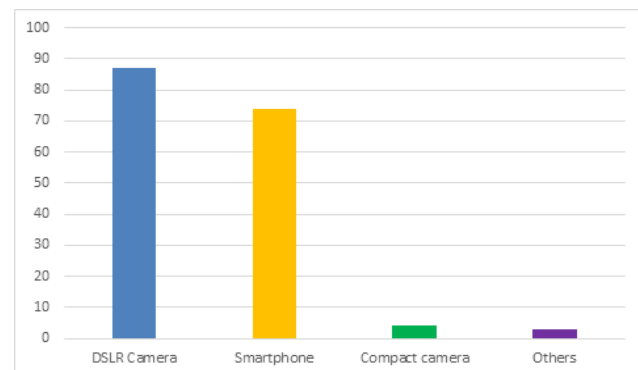


Figure 1. The photographic equipment distribution.

From the group of dentists who reported the use of digital photography, 88.1% mentioned its involvement in the communication with the dental technician through clinical images and 77.4% declared to follow a certain protocol when photographing.

No significant association was found between the experience in dental field and the use of clinical images in the communication with dental technician ($p > 0.05$) (Table IIIC). However, the experience in dentistry and the use of a certain photographing protocol were significantly associated ($p < 0.05$) (Table IIID), the observed frequency was greater than the expected for the practitioners from Group B, which were following a photographic protocol (observed value=31; ASR=3.2) indicating that they are more likely to use a photographic protocol than those from Group A and C.

Table II. Summary of the participants' responses.

		Q2		Q3			
		Yes	No	DSLR	Smartphone	Compact camera	Others
Q1	Gr. A <5 years (n=104)	78	26	32 (41.02%)*	44 (56.42%)*	1 (1.28%)*	1 (1.28%)*
	Gr. B 5-10 years (n=36)	32	4	17 (53.125%)*	12 (37.5%)*	1 (3.125%)*	2 (6.25%)*
	Gr. C >10 years (n=58)	58	0	38 (65.52%)*	18 (31.04%)*	2 (3.44%)*	0
		* from the respondents who are using photo equipment					
		Total (n=198)	168 (84.84%)	30 (15.16%)			
Question		Responses					
		Yes	No	I don't know			
Q4 (n=168)		148 (88.1%)	20 (11.9%)				
Q5 (n=168)		125 (74.4%)	43 (25.6%)				
Q6 (n=198)		168 (84.85%)	8 (4.04%)	22 (11.11%)			
Q7 (n=198)		190 (95.96%)	1 (0.5%)	7 (3.54%)			
Q8 (n=198)		190 (95.96%)	2 (1.01%)	6 (3.03%)			

Table III. Statistical analysis based on Chi-Square test of independence.

A. Experience vs. use of photography			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	18.661 ^a	2	.000
Likelihood Ratio	26.348	2	.000
N of Valid Cases	198		
a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.45.			
B. Experience vs. photographic set-up			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	8.908 ^a	2	.012
Likelihood Ratio	9.021	2	.011
N of Valid Cases	161		
a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 13.33.			
C. Experience vs. communication with dental technician			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	.259 ^a	2	.878
Likelihood Ratio	.271	2	.873
N of Valid Cases	168		
a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 3.81.			
D. Experience vs. photographic protocol			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	11.819 ^a	2	.003
Likelihood Ratio	15.279	2	.000
N of Valid Cases	168		
a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 8.19.			

The benefit of clinical images for a better communication with the dental technician was acknowledged by 95.96 of the dentists.

A percentage of 84.5% of the respondents consider that the use of photographic equipment also improves the communication with the patient and increases his/her confidence in the professional qualities of the dental team. Moreover, 95.96% of the respondents stated that the use of photographic equipment in dental office facilitates the work of the practitioner.

Discussion

The continuously increasing standards of esthetic dentistry involve the precise documentation of the initial case, but also predictable results of the dental treatment; to fulfill both these objectives, the use of accurate and detailed photographic images is recommendable. This study aimed to assess the use of dental photography in practices in Romania, as well as to establish the relation between the type of equipment and protocol used, indications of photography in the communication with the patients and

the dental technicians and the practitioner's experience.

The null hypothesis was partially rejected, since a relation was established between the experience of the practitioners and the use of dental photography, variant of equipment and protocol used.

The increasing number of complex cases that require photographic documentation and the financial stability that allows investment in photographic equipment may explain why the respondents from group C (more than 10 years of experience) were more likely to use digital photography in their practice than those from groups A and B. When analyzing the type of equipment chosen by the respondents from group C, most of the digital photography users were taking images with a DSLR Camera (65.52%) followed by 31.04% smartphone users. Conversely, 56.42% of the clinical photography users from group A mainly preferred a smartphone device and 41.02% a DSLR Camera. (Table II) This distribution may be also justified by the recent development of smartphone devices and their introduction in clinical practice including various fields such as esthetic analysis [8,14,15], teledentistry [16], dental traumatology

[17,18], radiology [19,20] or dental education [21]. Nonetheless, the high-quality images provided by a DSLR camera remain the golden standard in dental photography [4,6]. Previous studies found that dentists who graduated most recently (0-5 years) and those graduated longest (more than 20 years) were less likely to use clinical photography than those who had graduated between 6 and 20 years [22,23].

Additional lighting devices were developed to improve the performance of the smartphone camera. They feature multiple LED sources which provide continuous light suitable for better visualization of the elements from the oral cavity. There are several devices developed for the dentists available on the market: Smile Lite Mobile Dental Photography (Smile Line, St-Imier, Switzerland), PhotoMed SDL - Smartphone Dental Light (PhotoMed International, CA, USA) or COCO Lux (Hass Corp., Gangwon-do, Korea) [24,25,26]. The main advantage when using a smartphone and an additional LED light is the real time preview of the final result on the screen of the mobile phone. The purpose of the smartphone dental photography is to provide a simple, fast and easy to apply method of acquiring finest images in clinical practice.

The present study revealed that 84.84% of the respondents were using a photographic equipment in their clinical practice, while 44.05% of them were taking photos with a smartphone device. These percentages may be explained by the recent development of smartphone cameras and their extensive usage in dental medicine. The large number of digital photography users is confirmed by the fact that 95.96% of the participants included in this survey considered that digital imaging could facilitate their clinical procedures.

Similar studies were conducted to report the implementation of clinical photography among dental practitioners. The results are closely related with the technical progress of the available photographic equipment. Sharland et al. [22] found in 2004 that 36% of the respondents (general dental practitioners in UK) used clinical photography with 65% of them using a conventional 35 mm camera and 18% a digital camera. The follow-up of this study accomplished in 2010 by Morse et al. [23] revealed that 48% of the participants used clinical photography. From the above mentioned 34% used a 35 mm camera and 59% a digital camera. Uzunov et al. [27] reported in 2015 that 32.28% of the respondents (dentists practicing in Sofia, Bulgaria) were taking dental images.

Moreover, a percentage of 77.4% of the digital photography users were guided by a protocol when taking clinical images. Standard views were proposed by several authors [1,4,6] but further studies are necessary to establish an international photographic guide used in dental medicine.

However, no correlation have been established between the dentist's experience and the approach of

the photography as a method of communication with the dental technicians. Nowadays, the benefits of shared information, based on eloquent images of the patient's dental arches and face, as well as the pre-visualization of different treatment options are considered as prerequisites almost indispensable in dental esthetics. This might be the reason for the lack in the statistical differences regarding this approach, between the three groups of practitioners. In addition, dental shade matching is considered a key factor in the basic dentist-dental technician communication. Color matching based on accurate digital images, with the shade guide tabs adjacent to the tooth to be matched, represents a largely used alternative for the visual and instrumental methods [28,29,30,31]. A percentage of 88.1% of the digital photography users in this study were transferring clinical images to dental technician, while 95.96% of the respondents considered that this would facilitate the communication with the technical laboratory. This type of communication could provide constantly predictable results necessary for any collaboration.

The financial investment, time consuming method or additional training are reasons for not using clinical images [22,23,27]. The financial investment is constantly reduced by the fast development of new generation digital equipment. Well established protocols for the dental team should minimize the time spent for digital imaging. Additional training in undergraduate and graduate education in dental photography should facilitate the implementation in clinical practice.

Conclusions

The present study revealed that 84.84% of the respondents were using a photographic equipment in their clinical practice.

Respondents from group C (more than 10 years of experience) were more likely to use digital photography in their practice than those from group A (less than 5 years of experience) and B (5-10 years of experience).

The majority of the digital photography users from group C (more than 10 years of experience) were taking images with a DSLR Camera (65.52%) followed by 31.04% of smartphone users. Conversely, 56.42% of the clinical photography users from group A (less than 5 years of experience) mainly preferred a smartphone device and 41.02% a DSLR Camera.

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