Art and science of dental photography: suggested photographic protocol with cellular device

Arte e ciência da fotografia odontológica: sugestão de protocolo fotográfico com dispositivo celular

Arte y ciencia de la fotografía dental: protocolo fotográfico sugerido con dispositivo celular

DOI: 10.55905/oelv22n8-050

Receipt of originals: 07/01/2024
Acceptance for publication: 07/22/2024

Carolina de Assis Pinto Ferreira
Bachelor in Dentistry
Institution: Faculdade de Odontologia da Universidade Federal do Rio de Janeiro
Address: Cidade Universitária, Rio de Janeiro, Brazil
E-mail: carolinadeassispf@gmail.com

Fernanda de Araújo Verdant Pereira
Bachelor in Dentistry
Institution: Faculdade de Odontologia da Universidade Federal do Rio de Janeiro
Address: Cidade Universitária, Rio de Janeiro, Brazil
E-mail: nandaverdant@gmail.com

Mariana Vasconcellos Bazoli Rodrigues
Graduate student in Dentistry
Institution: Faculdade de Odontologia da Universidade Federal do Rio de Janeiro
Address: Cidade Universitária, Rio de Janeiro, Brazil
E-mail: marianabazoli1000@gmail.com

Juliana Lima de Oliveira Amorim Cabral
Bachelor in Dentistry
Institution: Faculdade de Odontologia da Universidade Federal do Rio de Janeiro
Address: Cidade Universitária, Rio de Janeiro, Brazil
E-mail: julianalimacabral@gmail.com

Inger Teixeira de Campos Tuña
PhD in Dentistry
Institution: Faculdade de Odontologia da Universidade Federal do Rio de Janeiro
Address: Cidade Universitária, Rio de Janeiro, Brazil
E-mail: ingertunas@gmail.com
ABSTRACT
Photography is characterized as the science and art of producing and creating images. With the evolution of technology, photography has permeated medical sciences, becoming an effective tool for different areas, such as Dentistry. For this reason, the aim of this study was to understand and discuss the importance of photography in the dental field, through a narrative literature review, and to produce a suggestion for a basic photographic protocol using a mobile phone, equipment available to a large portion of dental students and dentists. This article reviews dental photography through an advanced search in the PubMed and Virtual Health Library (VHL) databases. In addition, produce basic technical content, through a protocol, aimed at Dentistry students about the use of photography with cell phones. It has been found that photographic production depends on numerous factors: knowledge of basic photographic concepts, understanding of light manipulation techniques, and the use of equipment suitable for each case. From 1840 to the present day, photography has deeply permeated the dental context. However, there are different photographic protocols with distinct settings for intraoral and extraoral photographs. The protocol suggested in this study aimed to facilitate and standardize photographic documentation performed in the office, using a mobile phone, making the process simple and feasible for dental students and dentists. Photography plays a central role in contemporary Dentistry, being useful in different areas and facilitating the storage of patient data and treatment predictability. However, there is a necessity to promote the teaching of dental photography.

Keywords: Dental Photography, Dental Education, Photographic Protocol, Dentistry.

RESUMEN
La fotografía se caracteriza como la ciencia y el arte de producir y crear imágenes. Con la evolución de la tecnología, la fotografía ha permeado las ciencias médicas, convirtiéndose en una herramienta eficaz para diversas áreas, como la Odontología. Por lo tanto, el objetivo de este estudio fue comprender y discutir la importancia de la fotografía en Odontología, a través de una revisión narrativa de la literatura, y producir una sugerencia para un protocolo fotográfico utilizando un teléfono celular. Este artículo revisa la fotografía dental a través de una búsqueda avanzada en las bases de datos PubMed y Biblioteca Virtual en Salud (BVS). Además, producir contenidos técnicos básicos, a través de un protocolo, dirigido a estudiantes de Odontología sobre el uso de la fotografía con teléfonos celulares. Se encontró que la producción fotográfica depende de numerosos factores: conocimiento de conceptos básicos de fotografía, comprensión de técnicas de manipulación de la luz y uso de equipos adecuados. Desde 1840 hasta la actualidad, la fotografía ha calado profundamente en el contexto odontológico. Existen diferentes protocolos fotográficos con diferentes ajustes para fotografías intraorales y extraorales. El protocolo sugerido en este estudio tuvo como objetivo facilitar y estandarizar la documentación fotográfica mediante teléfonos celulares, viabilizando el proceso para estudiantes y odontólogos. La fotografía juega un papel central en la Odontología contemporánea, siendo útil en varias áreas y facilitando el almacenamiento de datos de los pacientes y la previsibilidad del tratamiento. Sin embargo, existe la necesidad de promover la enseñanza de la fotografía dental.

Palabras clave: Fotografía Dental, Educación Dental, Protocolo Fotográfico, Odontología.

1 INTRODUCTION

Photography is a blend of art and science that stems from the materialization of moments in the real world, but in reality, it is the imparting of meaning in the construction of a work: the image generated by a camera (Huda; Putera; Hendro, 2022). It is difficult to comprehend any human experience without the representativeness of the image, that is, in the present day, without an association with photography (Abouzeid et al., 2020). The evolution of photography in societies has allowed the act of capturing an object or moment to unquestionably overflow from the arts and reach industry and sciences, becoming essential for modern Dentistry (Kalpana et al., 2018; Surlari et al., 2022).
Global evolution with new circumstances and advancements in technology has emphasized the need for paradigm shifts in Dentistry, transcending traditionality to enable evolution in the quality of clinical practice (Lin et al., 2021). As a result, the advent of technology has led to the emergence of digital cameras and cameras in mobile phone devices (cell phones). These devices have become widely used in the dental universe routine to assist, mainly, in the fidelity of oral diagnosis and treatment planning (Abouzeid et al., 2020; Signori et al., 2018).

Furthermore, the use of photography in Dentistry can also be applied to documentation and records - related to Forensic Dentistry, education in oral health, communication between professional, laboratory, and patient, professional management and marketing, scientific research and development of didactic content, and interdisciplinary and multiprofessional communication (Abouzeid et al., 2020; Bogdan, 2022; Signori et al., 2018).

For the execution of photography in Dentistry, one must understand the basic tripod: photographer, patient, and equipment (Çifter, 2018). The items used for image capture provide the infrastructure for the professional to make photography a fantastic tool in Dentistry, capable of generating enthusiasm, transformation, and excellence in promoting health (Sincar et al., 2019; Surlari et al., 2018). For this reason, the proposal of the present study was to discuss, through a narrative literature review, the importance of photography in the dental scenario. Additionally, to produce basic technical content, through a protocol, primarily aimed at dental students regarding the use of photography with mobile devices.

2 THEORETICAL REFERENCE

Photography is considered an art and science of producing and recording images in the form of non-verbal communication (Huda; Putera; Hendro, 2022; Abouzeid et al., 2020). Image production occurs through the action of radiant energy (light) on a sensitive surface (Hardan; Moussa, 2020). The phrase “a picture is worth a thousand words” is known as a popular saying that can irrefutably summarize the role of photography in
societies, which is capable of generating information and entertainment (Abouzeid et al., 2020; Kalpana et al., 2018). The possibility of capturing images and sharing moments has transformed social relationships and their historical preservation methods (Kim, 2020).

Photography is embedded in different areas of human knowledge, encompassing the arts, communication, industry, and sciences (Kalpana et al., 2018). Currently, the use of photography has effectively and dominantly permeated medical sciences, especially in the field of Dentistry (Moussa et al., 2021).

Digital photography, a type of photographic recording in digitally computerized files, can be understood as essential for contemporary Dentistry as it ensures immediate error detection and offers easy storage (Abouzeid et al., 2020; Surlari et al., 2022). Furthermore, as photography has intertwined with technology, the act of producing images has become a fundamental part of information technology (Huda; Putero; Hendro, 2022).

2.1 THE EVOLUTION OF PHOTOGRAPHY

The history of photography spans about a century and a half (Abouzeid et al., 2020). In the year 1816, Nicéphore Niépce successfully took the first photograph (Hardan; Moussa, 2020). In the 19th century, the use of photography in Dentistry began (Alghulikah, 2022). The year 1840 is considered a milestone for the beginning of the relationship between Dentistry and photography when the first dental school was opened alongside a photographic gallery. This union between photography and dental medicine was operated by a professional who had become both a dentist and a photographer (Kalpana et al., 2018).

The following year, in 1848, Drs. R. Thompson and W. Elde, both from Columbus, Ohio, broke the boundaries between dental diagnosis and planning, by taking the first before-and-after photos in oral procedures and subsequently publishing this material in the form of an article (Kalpana et al., 2018).
The Classical Era of photography, characterized by the use of films and radiographic films, already influenced Dentistry, especially in the documentation of clinical cases. However, often errors in photography and development could only be detected days or weeks after capture, making the method a real struggle for professionals (Surlari et al., 2022).

In the mid-1970s, digital photography emerged, but it wasn't until the 1990s that this invention became popular as a replacement for conventional film-based photography (Kalpana et al., 2018; Hodson et al., 2020). The evolution of digital media allowed new programs, software, and tools to emerge to streamline the use of photography (Kalpana et al., 2018). In the 2000s, dental photography became more popular among dentists (Alghulikah, 2022).

2.2 PHOTOGRAPHY APPLIED TO DENTISTRY

Currently, photography can be applied to Dentistry in daily clinical practice for:
- documentation of procedures in each patient, with the ability to record data and document clinical events responsibly, serving as legal documentation for judicial and extrajudicial purposes (Kalpana et al.; 2018; Hodson; Donne1, 2020);
- clinical investigation, diagnosis, and refinement of treatment plans (Czerninski et al., 2019, Kalpana et al., 2018; Moussa et al., 2021);
- assistance in oral epidemiology, allowing the use of digital anatomical images for professional calibration in multicenters and standardization of oral images (Bogdan, 2022; Ciardo et al., 2022; Hogan et al., 2018);
- active communication with the patient for health education purposes, facilitating the exchange of information between the professional and the patient, leading to better understanding of the presented condition (Kalpana et al., 2018; Ong et al., 2022);
- communication among professionals, promoting interdisciplinarity in data collection in Dentistry (Kalpana et al., 2018);
- communication with the laboratory (Abouzeid et al., 2020; Lazar et al., 2022);
- advertising and marketing of services for professionals, making the visualization of specific skill procedures tangible through images. (Kalpana et al., 2018; Ong et al., 2022; Zoltie; Shemwood, 2019);
- creation of artistic photographs (Hardan; Moussa, 2020);
- self-assessment of professional results, aiding in the refinement and evolution of techniques (Kalpana et al., 2018; Çifter, 2022);
- educational purposes, for both academics and professionals, assisting in teaching, research, and clinical practice, and providing data for publications, classes, and lectures (Çifter, 2022; Moussa et al., 2021).

Based on its broad applicability, the full implementation of digital photography in clinical practice presents various benefits (Table 2), but it is still debated among dental professionals due to reasons such as cost, knowledge, long learning curve, and patient flow (Abouzaid et al., 2020; Bogdan, 2022). Despite the need for technical photographic knowledge, the oral cavity itself is a complex environment for image capture, as it involves hard tissues (teeth) and soft tissues (such as jugal mucosa, vestibular fornix and tongue) that encompass different types of hydration and mobility (Ong et al., 2022).

Table 1: Advantages and disadvantages of dental photography.

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Easy image storage, manipulation and enhancement.</td>
<td>● Investment in equipment and cost of acquiring knowledge.</td>
</tr>
<tr>
<td>● Non-invasive and convincing.</td>
<td>● Long learning curve.</td>
</tr>
<tr>
<td>● It speeds up communication.</td>
<td>● Change in the flow of services.</td>
</tr>
<tr>
<td>● It helps with teaching and the production of scientific content.</td>
<td>● Complexity of the oral environment.</td>
</tr>
<tr>
<td>● It guarantees predictability.</td>
<td></td>
</tr>
</tbody>
</table>

Adapted from Hogan et al. (2018); Abouzaid et al. (2020); Ong et al. (2020); Harikrishnan et al. (2023).
Source: Author.

2.3 TECHNICAL PHOTOGRAPHIC CONCEPTS FOR DENTISTRY

To achieve faithful photography in Dentistry, meaning the ability to accurately reproduce the visualized object, technical knowledge with its involved parameters (Table 2) is necessary (Hodson; Donnel, 2020).
### Table 2: Photographic concepts and their meanings.

<table>
<thead>
<tr>
<th>Concept</th>
<th>Definition</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>International Organization for Standardization (ISO)</td>
<td>Represents the sensitivity of the camera sensor to light. The higher the ISO, the greater the sensitivity of the camera sensor to light. However, ISO is inversely proportional to the quality of the image to be obtained by the camera.</td>
<td>Wagner (2020); Ong et al. (2022)</td>
</tr>
<tr>
<td>Shutter speed</td>
<td>This corresponds to the speed that the camera's shutter will respond to in order to capture the image, i.e. the amount of light that the camera will absorb.</td>
<td>Wagner (2020); Ong et al. (2022)</td>
</tr>
<tr>
<td>Diaphragm aperture (F-number)</td>
<td>Depicts the dimensions of a camera's diaphragm. The aperture of the diaphragm is inversely proportional to the depth of the image, i.e. a larger diaphragm aperture (low F number) determines an image with shallow depth.</td>
<td>Ong et al. (2022)</td>
</tr>
<tr>
<td>Focal length</td>
<td>The focal length is the distance between the lens (optical center - convergence of light) and the camera sensor.</td>
<td>Saincher et al. (2022)</td>
</tr>
<tr>
<td>Barrel effect</td>
<td>This effect is characterized by image distortions due to the close proximity of the camera to the subject. The solution found to nullify the barrel effect is to increase the distance between the camera and the object.</td>
<td>Moussa et al. (2021)</td>
</tr>
</tbody>
</table>

Source: Author.

### 2.4 TEACHING DENTAL PHOTOGRAPHY

Starting from 2020, with the occurrence of the COVID-19 pandemic, dental practice and the teaching of Dentistry underwent significant modifications. Consequently, new teaching-learning methodologies gained prominence in the pandemic scenario, along with certain themes: technology applied to Dentistry. The new digital technologies influenced the speed of image generation, communication, and accessibility, emphasizing the use and application of digital photography (Botelho; Boubaker; Wong, 2023; Kalpana et al., 2018).

Digital photography is considered essential for dental education and practice (Kalpana et al., 2018). Dental students use photographs to record various stages of treatments performed and also as a study tool (Albugami et al., 2021). However, there are few theoretical and media resources available regarding dental photography for the learning of dental students, with a clinical curriculum focused on specific procedures related to dental structure.
Furthermore, it is notable that photography education is focused on optional courses or updates for graduated professionals, not comprising the core curriculum of undergraduate education (Zoltie; Shemwood, 2019). In traditional undergraduate Dentistry programs, there is no discipline or course on dental photography included in the basic curriculum (Abouzeid et al., 2020).

Photography has now assumed a prominent position and has become essential for the basic curriculum of dental students, who need to understand the fundamental concepts and techniques, as well as have access to appropriate materials to capture images beneficial for learning and daily clinical practice (Botelho; Boubaker; Wong, 2023).

2.5 CREATION OF A PHOTOGRAPHIC PROTOCOL USING A CELL PHONE

Based on the aforementioned scenario, a photographic protocol using a cell phone was developed. For the correct imaging of soft and hard tissues, the iPhone 14 Pro Max device (Table 3) was selected, which is functional for dental photography when performed properly and standardized.

<table>
<thead>
<tr>
<th>Table 3: Iphone 14 Pro Max camera information.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iphone 14 Pro Max camera</td>
</tr>
<tr>
<td>Display</td>
</tr>
<tr>
<td>Screen</td>
</tr>
<tr>
<td>Camera</td>
</tr>
<tr>
<td>Source: Author.</td>
</tr>
</tbody>
</table>

Nowadays, there are different cameras available on the market, with two main ways of capturing digital photographs in dentistry: Digital Single-Lens Reflex (DSLR) cameras or mobile device cameras (smartphones or cell phones) (Moussa et al., 2021; Ong et al., 2022; Saincher et al., 2022). DSLRs have specific settings for capturing photographs and are widely used by professional photographers (Moussa et al., 2021). In comparison, cell phone cameras are able to automatically adjust the parameters for

1 Telephone device released in September 2022 by the multinational company Apple.
photographs and provide a simple, easy and fast method for producing images that are instantly on the cell phone screen (Lazar et al., 2022; Moussa et al., 2021).

At the same time, the literature presents different protocols to be applied to photography - only with professional cameras - in dentistry (Kalpana Moussa et al., 2028; Bogdan, 2022; Wagner, 2020). However, there are precepts in line with these that can be extrapolated to cell phone cameras. Intraoral photographs should adequately show the patient's occlusal relationship and dentition, just as extraoral photographs should show the entire face of the individual (Çifter, 2018).

For extraoral photographs, it is a priority for the reproducibility of the photographs that the patient is 1 meter from the camera, removes any facial accessory - especially glasses - has their ears visible and their head is aligned at 90º to the camera (looking towards the horizon). At the same time, in intraoral photographs, the patient must be positioned at a 45º angle to the ground and the camera viewfinder must be correctly aligned with the patient in relation to the occlusal plane (Ong et al., 2022).

In addition to the correct positioning of the patient, the camera and the professional, it is important to know and master the appropriate parameters for taking extraoral and intraoral photographs. This knowledge, applied in practice, allows for appropriate resolution and true color rendering of the image, which means that small details of the oral tissues and colors can be visualized in a way that is more in line with what is perceived by the naked eye (Hodson; Donnel, 2020).

The literature findings were summarized in a 5-page photographic protocol (figures 1 and 2).
Figure 1: Cover.

Photographic Protocol with Smartphone

Material developed by Carolina de Assis Rinto Ferreira as part of the Capstone Project presented to the Dentistry Course at the Federal University of Rio de Janeiro (UFRJ).

Advisor: Prof. Inger Teixeira de Campos Tuñas, PhD

The aim of this smartphone photography protocol is to help you take dental photographs, based on basic technical content, aimed primarily at dental students.

*All the dental photographs contained in this protocol were obtained after written consent had been obtained authorising the use of the images.

Rio de Janeiro
2023

Source: Author
Figure 2: Equipment and extraoral and intraoral photographs.

**PHOTOGRAPHY WITH SMARTPHONE**

**Equipment and accessories:**
- Cell phone
- Lip retractor
- Mirror for intraoral photography
- Black background / contrast (black plastic or black cardboard cut into a trapezoid)

**Extraoral PHOTOGRAPHY**

1) **Frontal face view**

[Image: Frontal photo with lip at rest, natural smile and forced smile.]

2) **Profile face view**

[Image: Lateral photo with lip at rest, natural smile and forced smile.]

For extraoral photography:
- Choose a light or dark background with no shadows.
- The patient should be 1 meter from the camera with eyes exposed and without wearing glasses or other accessories.
- The dental surgeon/graduate student/photographer should position the cell phone vertically or the same height as the patient and facing the patient, who should be in a supine position.
- The patient’s mouth should be as open as possible (without tension) and the lips should be relaxed.
- The photographer should be parallel to the ground.

**Intraoral PHOTOGRAPHY**

1) **Anterior - occlusion and separated teeth**

[Image: Occlusal plane parallel to the frame of the photo and in the center of the camera.]

2) **Right and left lateral occlusion**

[Image: Occlusal plane parallel to the frame of the photo and in the center of the camera.]

3) **Upper and lower occlusal**

[Image: Occlusal plane parallel to the frame of the photo and in the center of the camera.]

**Intraoral PHOTOGRAPHY**

4) **Upper arch with black background**

[Image: With black background / contrast (black plastic or black cardboard cut into a trapezoid).]

5) **Protrusion and laterality (right and left)**

[Image: Protrusion and laterality (right and left).]

The use of images was authorized by written and signed consent.

**Source:** Author
3 METHODOLOGY

A descriptive research was conducted through a narrative literature review on dental photography. An advanced search was carried out in the PubMed and Virtual Health Library (VHL) databases using Health Sciences Descriptors: Photography, Dental Photography, and Dentistry, both in MeSH (Medical Subject Heading) and in TIAB (Title and Abstract), using the boolean operators OR and AND.

The initial search yielded 2658 articles, and after applying the inclusion and exclusion criteria (Table 5) and removing duplicates, 26 articles were selected for inclusion in this work. The application of criteria and removal of duplicates were performed using the Rayyan platform.

<table>
<thead>
<tr>
<th>Inclusion Criteria</th>
<th>Exclusion Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Articles in their complete versions and free of charge or available on the CAPES (Coordination for the Improvement of Higher Education Personnel) platform; In Portuguese, Spanish and/or English; Published from 2018; Related to dental photography.</td>
<td>Duplicate articles; Articles that dealt with photography in teledontology or remote oral health assessment and diagnosis, cross-polarization photography and color matching; Letters and replies to the editor.</td>
</tr>
</tbody>
</table>

The article selection strategy was based on an initial search using Health Sciences Descriptors (n = 2658), followed by the application of criteria for articles published from 2018 onwards, freely available or provided by CAPES, complete and in Portuguese, Spanish, and/or English languages (n = 169). After reading the titles and abstracts and also removing duplicates, the total number of eligible articles was reached (Figure 3).
Based on the theoretical findings of the integrative literature review, a suggestion for a basic photographic protocol has been crafted, which can be carried out using mobile phones/smartphones.

4 RESULTS AND DISCUSSIONS

Photography has a considerable impact on dental practices with different applications, and is widely used for diagnosis and treatment planning. Dental photography improves oral diagnosis when compared to clinical assessment based on visual and tactile findings in traditional dentistry (Hogan et al., 2018). According to Hogan et al. (2018), the resolution rates of dental cases are considered to be higher with photography-assisted diagnosis than with traditional clinical assessment, since there is the possibility of image enhancement, which would facilitate diagnosis.

Furthermore, the accuracy of assessing dental alterations and even restorations is considered to be greater with the photographic method than with conventional clinical examinations, making it suitable for use in epidemiological studies (Ciardo et al., 2022). Signori et al. (2018) reinforce that photography, through the possibility of image enhancement, can improve diagnostic accuracy.
magnification and high sensitivity, favors the finding of defects and conditions not previously seen in the clinic.

Despite the confirmed benefits of using dental photography, many professionals are reluctant to use it in their daily practices. According to Kalpana et al. 2018, this phenomenon may be associated with a lack of technical knowledge and practice, the prospect of interrupting the usual clinical workflow and, above all, the expense of investing in equipment and technical training. However, it is reported that equipment costs are decreasing with the advancement of technologies (Kalpana et al., 2018).

In addition, these professionals consider the technical learning of photography as a barrier to its use (Çifter, 2018). Or, in line with Zoltie and colleagues (2019), they view photography as "... an exotic hobby of interest to a minority of enthusiasts and, at worst, a set of mechanical skills with no broader intellectual or professional significance.". Other professionals have a condition named by Hodson and Donnell (2020) as "Technophobia of Dental Photography", which is a phobia of digital photography as they consider it to be highly complex and difficult to handle technically.

However, according to Ong et al. 2022, the current scenario of contemporary dentistry requires each professional to act with a broad and individualized perspective, which highlights photography as an option to meet the demands of the current scenario. Digital photography clearly benefits diagnosis, planning, case improvement and predictability, communication and education (Ong et al., 2022). In the study conducted by Alghulikah (2022), it was observed that 86% of the participating professionals used photography in their daily clinical practice. Sharland et al. and Morse et al. (apud Alghulikah, 2022) reported that around 36% to 48% of professionals used dental photography in the United Kingdom.

The main equipment used for dental photography are DSLR cameras and cell phones. On the use of this equipment in dentistry, Ong et al. (2022) state that "Cell phone cameras are not recommended for routine dental photography. The cameras lack the necessary settings to produce intraoral photographs.". Lazar et al. (2022) call DSLR cameras the "gold standard" of dental photography.
However, there are positive results that show that mobile phone cameras, in spite of their limitations in adaptation, are promising for dental purposes and can be compared to DSLR cameras for oral diagnosis and evaluation of dental trauma (Saincher et al., 2022).

Moussa et al. (2021) compared DSLR cameras with a smartphone in their study (Iphone X\(^2\)). The data found emphasized that, regardless of the device or the distance between the subject and the camera, the information provided by the photographs is comparable and compatible for documentary purposes (Moussa et al., 2021).

Furthermore, despite the knowledge of DSLR cameras as the most suitable standard for oral photographs, the results of the cross-sectional survey conducted by Alghulikah (2022) in Saudi Arabia revealed that more than half of the participants took their photographs with cell phones and less than 30% with DSLR cameras. The favorable results of smartphone photography reverberate and reaffirm the need to build educational materials that take this scenario into account (Alglulikah, 2022).

In line with this, different studies have reported a lack of information about dental photography for undergraduate dental students (Kalpana et al., 2018; Kim, 2020; Zoltie, 2019). Inattention to photographic teaching at undergraduate level is associated with the basic curriculum's emphasis only on specific procedures for the clinic (Kim, 2020). The author Kim (2020) reported that there is little theoretical scientific content available for acquiring knowledge of this subject for individuals who are still students, with some institutions lacking reading material and others multimedia content.

At the same time, the lower availability of knowledge for undergraduate students supports findings such as that of Albugami et al. (2021), who found that dental students' knowledge of dental photography was unsatisfactory. Alghulikah (2022) showed in his studies that less than 30% of the dentists surveyed acquired their photographic skills during their undergraduate course.

Although there is little content and unsatisfactory knowledge, there is a high level of awareness of dental photography among undergraduate dental students, who are very

---

\(^2\) Aparelho telefônico lançado em novembro de 2017 pela empresa multinacional Apple.
interested in the subject and believe that this knowledge is useful in daily clinical practice (Abouzeid et al., 2020).

5 CONCLUSION

In the light of this review, it can be concluded that dental photography is fundamental to daily clinical experience, providing an up-to-date view of clinical practice. Photographing in dentistry guarantees detailed patient documentation, predictability and easy data storage, but the obstacles of cost, the knowledge curve to be acquired and changes in the flow of care are still taken into account.

At the same time, photography's ability to play a diverse role in the dental scene allows it to reinforce its importance and overflow its definition as a science, becoming a valuable tool for communication and the propagation of art.

Based on the theoretical basis for the construction of the above photographic protocol, it became clear that educators need to understand the role of photography in dentistry, encourage photographic education for students, and reinforce the need to update traditional curricula to cover new skills.

ACKNOWLEDGMENT

We would like to thank everyone who contributed directly and indirectly to the creation of this work.
Financial and material support for the preparation of this article was provided by the authors in conjunction with the Faculty of Dentistry of the Federal University of Rio de Janeiro.
REFERENCES


