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DEVELOPMENTANDVALIDATIONOFADIGITALPATIENTGUIDETOCLINICALPHOTOGRAPHYFORTELECONSULTATIONINDERMATOLOGY

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Development and Validation of a Digital Patient Guide to Clinical Photography for Teleconsultation in Dermatology

Bruno Simao dos Santos ^α & Alexandra Maria Monteiro Grisolia ^ο

Abstract- Introduction: Dermatological teleconsultation requires patients to provide high-quality images of cutaneous lesions for accurate diagnosis and treatment. Patients assume a pivotal role in teledermatology by effectively documenting skin lesions using standardized photographs. This study aimed to develop and validate a digital guide to assist patients in adequately documenting cutaneous lesions for dermatological teleconsultations.

Methods: Applied developmental research methods were employed in this study. Bibliographic research was conducted to determine the requirements for high-quality photographic documentation for dermatology. These investigative findings were adapted into a digital guide for patients using simple and accessible language. Subsequently, the digital guide underwent validation by dermatologists and laypeople through questionnaires using a five-point Likert scale and statistical analysis to assess reliability and concordance regarding its content and purpose.

Results: After selecting twenty articles, the digital patient guide was developed. It was based on photographic documentation orientations tailored for primary care physicians due to the lack of materials directed at patients. Reliability analysis revealed Cronbach's alpha coefficients of 0.945 for laypeople and 0.718 for experts. The concordance analysis of dermatologists' questionnaires yielded an intraclass correlation coefficient of 0.79 (95% CI 0.48–0.95). Median Likert scale scores were 4.81 for dermatologists and 5.0 for laypeople.

Conclusions: This study successfully developed a digital patient guide for clinical photography of cutaneous lesions. The validation process, which involved dermatologists and laypeople, confirmed consensus and acceptance of the digital guide, highlighting its potential practical utility.

Keywords: telemedicine. teledermatology. remote consultation. dermatology. digital health. clinical photography. teleconsultation. direct-to-consumer teledermatology. patient digital guide. mobile teledermatology.

I. INTRODUCTION

Teleconsultation in dermatology, commonly referred to as direct teledermatology, involves the remote management of patients with dermatological conditions.¹ Dermatology is a medical specialty in which physical examination is visual and is conducted by

inspecting the patient's skin.² In teledermatology, the most fundamental requirement for accurate diagnosis is the inspection of high-quality images of the patient's skin lesions.³ Given this scenario, the success of a virtual dermatological examination primarily depends on the patient's active participation, which enables the dermatologist to observe clinical changes indicative of the patient's condition. To ensure the success of teleconsultation, patients must learn how to photograph their skin lesions in a standardized manner.⁴ However, a current gap in the academic literature involves the lack of educational resources on clinical photography for teledermatology that are explicitly tailored for patients. Hence, this study aimed to develop and validate a digital guide to assist patients with proper photographic documentation of cutaneous lesions for dermatological teleconsultations.

II. METHODS

Applied developmental research methods were employed in this study. The study design was based on several previously published papers related to the development and validation of educational resources in healthcare.⁵⁻⁷ The Institutional Review Board approved this research.

The development of the digital guide, which commenced with a bibliographic search on the PubMed/MEDLINE and Virtual Health Library/LILACS databases, involved searching for studies that presented guidelines for obtaining clinical photographs of dermatological lesions. The keyword combinations used in the search included "teledermatology," "teleconsultation," "guide," "photography," "photo documentation," "telemedicine," "teleconsultation," "physical examination," "dermatology," and "digital manual." The selection of studies retrieved from the search was based on the following eligibility criteria: 1) articles related to guidance on photographic documentation of cutaneous lesions; 2) articles published between 2019 and 2023; and 3) articles in English, Portuguese, or Spanish.

The primary technical requirements for high-quality photographic documentation of dermatological lesions were derived from the selected articles. Based on these findings, the digital guide for patients was

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developed by adapting the content to a lay audience in a lucid, concise, and intelligible manner. Plain language was given priority, medical jargon was consciously avoided, and sequential steps were established for executing photographic documentation to enhance comprehension of content. Subsequently, illustrations were produced, and the guide's layout was created by applying graphic design techniques.

The digital guide underwent a two-stage validation process in a virtual environment. The objective was to assess both the content and educational purpose of the digital guide. Dermatologists evaluated the guide in the first stage, followed by assessment from laypeople in the second stage.

Online questionnaires, created using the research management application Google Forms (Google LLC, 2023), served as the validation instrument for the study. The questionnaires comprised multiple-choice questions about sociodemographic profiles with a maximum of five options, as well as statements with responses on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The statements in both questionnaires, which were related to the content and purpose of the digital guide, are provided in Table 1 and Table 2.

In the first validation phase, intentional sampling was employed to deliberately select dermatology experts based on their technical attributes and capacity to contribute to the study. Eligibility criteria included board-certified dermatologists with at least three years of practical experience. In the second validation phase, volunteer laypeople were recruited using convenience sampling according to their availability and interest in participating. The eligibility criteria included individuals aged 18 years or older without a professional background in healthcare.

Participants received via email (Gmail, Google LLC, 2023) the link to access the digital guide, an online questionnaire specific to their group, and an informed consent form. These documents were stored and synchronized on the Google Drive cloud server (Google LLC, 2023). All participants in this study provided informed consent.

Statistical analysis of the data obtained from questionnaire responses was conducted using R software (version 4.3.2, R Core Team, 2023) and its "psych" package (version 2.3.6, The Comprehensive R Archive Network, 2023).

The reliability of the questionnaires was assessed by analyzing their internal consistency using Cronbach's alpha, which is considered adequate when between 0.70 and 0.95. Concordance within the expert group was evaluated by the intraclass correlation coefficient (ICC), utilizing a two-way mixed-effects statistical model with absolute concordance. Fleiss' classification was used to interpret the ICC as follows:

<0.40, poor; 0.40–0.75, moderate; 0.75–0.90, substantial; and >0.90, excellent.

The distribution of responses for each statement of the questionnaires was assessed. Analyzing the Likert scale scores, the final score was calculated as the mean and median of all questionnaire statements. Unanswered items were excluded from the calculations. Consensus among participants was defined as median values of 4 or higher on the Likert scale, with at least 80% of responses falling into categories 4 and 5. The normality of the data was assessed using Shapiro–Wilk tests. Subsequently, Likert scale scores based on the sociodemographic profiles of the participants were statistically evaluated using Mann–Whitney and Kruskal–Wallis tests.

III. RESULTS

A total of 590 articles with titles and abstracts were initially considered for selection. After applying the eligibility criteria, 50 articles were selected for full-text analysis. Finally, mentions of guidance on dermatological photographic documentation were identified in 20 articles.^{2-4,8-24} Most of these articles were intended for general practitioners acquiring patients' images for remote consultations with dermatologists.

Drawing from these papers, we selected the essential technical requirements for capturing appropriate and high-quality photographs of patients' cutaneous lesions for teledermatology. Based on those findings, the digital guide was created. It comprises a front cover, a title page, a table of contents, ten pages, and a back cover. In total, there are 24 distinct illustrations throughout the content pages. The title is "How to Take Photos for Online Consultations in Dermatology," with the subtitle "Digital Patient Guide for Photography of Skin Conditions in Teledermatology" (Figure 1).

During the validation phase of the digital guide, Cronbach's alpha coefficients were 0.945 for the layperson group and 0.718 for the expert group.

Twelve dermatologists were invited to participate in the study, and ten consented to participate in the research. The questionnaire responses were collected in July and August 2023. The majority of dermatologists were female (60.0%) and aged 40–49 years (60.0%), with the next largest group aged 30–39 years (20.0%). Their clinical experience ranged from 11–20 years (30.0%) to 21–30 years (30.0%). Most had completed a medical residency (80.0%), 20.0% held doctorates, and 60.0% were affiliated with academic institutions.

After that, 50 volunteer laypeople were recruited for the study; of these, 17 were excluded based on the eligibility criteria. Thus, the final sample consisted of 33 lay participants who responded to the questionnaire in October 2023. In this group, the majority of participants

were male (54.5%) and aged 20–29 years (42.4%), with the next most extensive group aged 30–39 years (30.3%). Most reported daily internet use (87.9%) and reading of online materials (81.8%).

In evaluating dermatologists' responses to the questionnaire components within Likert scale categories 4 and 5, the results were as follows: 100% of participants found the instructions relevant, perceived the language as accessible to laypeople, and agreed that the guide was suitable for instructing patients participating in dermatology teleconsultations. Additionally, 90% considered the amount of information appropriate. Furthermore, expert participants unanimously concurred that the title and subtitle were coherent, the material addressed critical aspects of photographic documentation of skin lesions, and the guide would effectively clarify patients' doubts during dermatological teleconsultations (Table 1). The ICC for the concordance analysis of the dermatologists' responses was 0.79 (95% CI 0.48–0.95), with an *F*-test statistic of 4.83 ($p < 0.001$).

The distribution of laypeople's responses to the questionnaire components within Likert scale categories 4 and 5 revealed that 81.9% found the manual's appearance suitable, 87.8% considered the page quantity satisfactory, 93.9% asserted that they had no doubt about taking photographs after reading the guide, and 94% agreed that illustrations enhanced text comprehension. Furthermore, 94% of the laypeople deemed the instructions necessary, 90.9% acknowledged the ease of locating information in the manual, 94% asserted that they understood how to take photographs after reviewing the manual, and 93.9% found the guide's text easy to read (Table 2).

In the analysis of Likert scale score responses across all questionnaire statements, laypeople had a mean score of 4.70, a median of 5.0, and a standard deviation of 0.55. The Shapiro–Wilk test had a highly significant result, indicating that the data were not normally distributed ($p < 0.001$). Among the dermatologists, the mean score was 4.79, the median was 4.81, and the standard deviation was 0.21. The Shapiro–Wilk test produced a statistically significant result, again indicating that the data were not normally distributed ($p = 0.036$). The different sociodemographic variables examined did not significantly influence the mean scores of either laypeople or expert participants. This suggests a consistent perception of the guide's acceptance across diverse sociodemographic groups.

IV. DISCUSSION

Previous studies have suggested that dermatologists ask their patients to share standardized photographs of cutaneous lesions either before or during teleconsultations. This recommendation is grounded in the understanding that the resolution of

available video images during synchronous teleconsultation can be limiting for many patients, thereby hindering the comprehensive evaluation of cutaneous lesions.^{15,19} In line with these considerations, the digital guide developed in this study assists patients in autonomously documenting their dermatological lesions using standardized photographs before teleconsultations. This proactive approach is designed to facilitate a more thorough virtual physical examination by dermatologists.

Moreover, earlier studies have offered practical recommendations to physicians and patients participating in teledermatology to enhance their online consultations.^{17,19} One article, in particular, provided physicians with guidance on improving the quality of clinical photographs submitted by patients.¹⁷ However, the bibliographic research conducted in this study did not reveal any specific materials designed for direct online access by patients. The digital guide developed in this study aims to address this gap in teledermatology and can be shared online with patients before a teleconsultation.

In the validation stages of the digital guide, Cronbach's alpha suggested that the questionnaires exhibited good internal consistency. The median Likert scale responses indicated high levels of acceptance and understanding of the digital guide among both dermatologists and laypeople. The ICC underscored a substantial level of concordance among dermatologists, which is unlikely to be attributed to random fluctuations. In studies on standardized photographic documentation of cutaneous lesions, training positively influenced family physicians' performance in requesting remote dermatological consultations, enhancing image quality, and improving teledermatology services.² The adoption of standardized photographs significantly reduced the need for in-person appointments.²⁵ Given these benefits, the digital patient guide has the potential to shape outcomes in dermatological teleconsultations, and future studies in practical settings using the digital guide would provide opportunities for exploration and validation.

V. CONCLUSIONS

This study reports the successful development of a digital guide tailored for dermatological clinical photography for teleconsultations explicitly designed for patient use. The guide underwent validation by dermatologists and laypeople, both of whom expressed satisfaction with its content and purpose.

The digital patient guide for documenting cutaneous lesions through clinical photography endeavors to assist patients by simplifying the process of generating high-quality clinical images for remote dermatological evaluations.

VI. DIGITAL GUIDE AVAILABILITY

The digital patient guide files are openly available in a data repository (Zenodo, European Organization for Nuclear Research and OpenAIRE, 2023).

Portuguese version: <https://doi.org/10.5281/zenodo.10883027>

English version: <https://doi.org/10.5281/zenodo.10892200>

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Figure 1: Example of the Digital Patient Guide: Table of Contents and Some of Illustrated Pages

Table 1: Distribution of Responses to the Likert Scale Questionnaire about the Digital Guide that was Administered to Participating Dermatologists

Statement	1	2	3	4	5
The orientation contained in the guide is relevant.	0	0	0	2 (20%)	8 (80%)
The language of the guide is accessible to laypeople.	0	0	0	3 (30%)	7 (70%)
The amount of information contained in the guide is adequate.	0	0	1 (10%)	5 (50%)	4 (40%)
The main title and subtitle are consistent with the purpose of the guide.	0	0	0	0	10 (100%)
The illustrations in the guide are appropriate for the corresponding text.	0	0	0	1 (10%)	9 (90%)
The guide addresses the main aspects related to photographic documentation of skin lesions by the target audience.	0	0	0	0	10 (100%)
The guide's content will help clarify patients' doubts regarding photographic documentation of skin lesions for dermatological teleconsultation.	0	0	0	0	9 (100%)
The guide is suitable for a patient participating in a dermatological teleconsultation.	0	0	0	4 (40%)	6 (60%)

Note: 1: Strongly disagree; 2: Partially disagree; 3: Neutral; 4: Partially agree; 5: Strongly agree.

Table 2: Distribution of Responses to the Likert Scale Questionnaire about the Digital Guide that was Administered to Participating Laypeople

Statement	1	2	3	4	5
The appearance of the guide is adequate.	0	0	6 (18.2%)	5 (15.2%)	22 (66.7%)
The number of pages is satisfactory.	0	1 (3%)	3 (9.1%)	8 (24.2%)	21 (63.6%)
After reading the guide, there were no doubts about how to take photographs for the online consultation.	0	1 (3%)	1 (3%)	1 (3%)	30 (90.9%)
The illustrations in the guide help the reader understand the text.	0	1 (3%)	1 (3%)	2 (6.1%)	29 (87.9%)
The orientation contained in the guide is important.	0	0	2 (6.1%)	5 (15.2%)	26 (78.8%)
It is easy to find information in the guide.	0	0	3 (9.1%)	4 (12.1%)	26 (78.8%)
After reading the guide, it was possible to understand how to take photographs for the online consultation.	0	0	2 (6.1%)	2 (6.1%)	29 (87.9%)
The guide text is easy to read.	0	0	2 (6.1%)	3 (9.1%)	28 (84.8%)

Note: 1: Strongly disagree; 2: Partially disagree; 3: Neutral; 4: Partially agree; 5: Strongly agree.