

Evaluation of adherence to the use of teledentistry by dental surgeons in a specialty center (state of São Paulo, Brazil)

Avaliação da adesão ao uso da teleodontologia por cirurgiões-dentistas em um centro especializado (estado de São Paulo, Brasil)

Priscila Rodrigues da SILVA¹ , Jorge Kennety Silva FORMIGA¹ , Liliam Monteiro Cunha JACOB² ,
Mary Caroline SKELTON-MACEDO³ , Suzelei RODGHER¹ 

1 - Universidade Estadual Paulista, Instituto de Ciência e Tecnologia. São José dos Campos, SP, Brazil.

2 - Ortogeo. São José dos Campos, SP, Brazil.

3 - Universidade de São Paulo. São Paulo, SP, Brazil.

How to cite: Silva PR, Formiga JKS, Jacob LMC, Skelton-Macedo MC, Rodgher S. Evaluation of adherence to the use of teledentistry by dental surgeons in a specialty center (state of São Paulo, Brazil). *Braz. Dent. Sci.* 2026;29:e5139. <https://doi.org/10.4322/bds.2026.e5139>

ABSTRACT

Objective: This study aimed to evaluate the knowledge, perceived security, and interest of dentists in adopting digital tools designed for teledentistry within the Ortogeo institution. **Material and Methods:** A cross-sectional, quantitative investigation was conducted with 205 dentists between May and December 2024. Data were collected through a structured questionnaire composed of open- and closed-ended questions. Descriptive and inferential analyses were applied to explore associations between technological adoption and variables such as prior knowledge, use of messaging applications, perceived security, and the number of advantages identified by participants. **Results:** The findings revealed that 64.88% of respondents were familiar with the concept of teledentistry, 72.68% used WhatsApp® as a telehealth resource, and 92.68% expressed interest in adopting a dedicated digital platform, provided it ensured regulatory compliance and data security. Statistically significant correlations were observed between interest in adopting the platform and prior knowledge, messaging app usage, perceived security, and the number of perceived benefits. Open-ended responses highlighted agility, convenience, and time savings as the main advantages, while limitations included the impossibility of clinical examination, legal uncertainties, and regulatory gaps. **Conclusion:** The study demonstrates that, although teledentistry is recognized as a valuable tool by most professionals, its successful implementation requires ongoing professional training, secure technological solutions, and the establishment of public policies that ensure ethical and regulated integration into clinical practice.

KEYWORDS

Digital Health; Questionnaire; Remote Patient Monitoring; System Tools; Teledentistry.

RESUMO

Objetivo: Este estudo teve como objetivo avaliar o conhecimento, a segurança percebida e o interesse de dentistas na adoção de ferramentas digitais para teleodontologia na instituição Ortogeo. **Material e Métodos:** Foi realizada uma investigação transversal quantitativa com 205 dentistas entre maio e dezembro de 2024. Os dados foram coletados por meio de um questionário estruturado composto por perguntas abertas e fechadas. Análises descritivas e inferenciais foram aplicadas para explorar as associações entre a adoção tecnológica e variáveis como conhecimento prévio, uso de aplicativos de mensagens, segurança percebida e o número de vantagens identificadas pelos participantes. **Resultados:** Os resultados revelaram que 64,88% dos respondentes estavam familiarizados com o conceito de teleodontologia, 72,68% utilizavam o WhatsApp® como recurso de telessaúde e 92,68% expressaram interesse em adotar uma plataforma digital dedicada, desde que garantisse a conformidade regulatória e a segurança dos dados. Correlações estatisticamente significativas foram observadas entre o interesse em adotar a plataforma e o conhecimento prévio, o uso de aplicativos de mensagens, a segurança percebida e o número de benefícios percebidos. As respostas abertas destacaram agilidade, conveniência e economia de tempo como as principais vantagens, enquanto as limitações incluíram a impossibilidade de exame clínico, incertezas legais e lacunas regulatórias. **Conclusão:** O estudo demonstra que, embora a teleodontologia seja reconhecida como uma ferramenta valiosa pela maioria dos profissionais, sua implementação bem-sucedida requer treinamento profissional contínuo, soluções tecnológicas seguras e o estabelecimento de políticas públicas que garantam a integração ética e regulamentada na prática clínica.

PALAVRAS-CHAVE

Saúde Digital; Questionário; Monitoramento Remoto em Pacientes; Ferramentas de Sistema; Teleodontologia.

INTRODUCTION

Telehealth emerged globally around 2006, with the first scientific reports highlighting its applicability in health care. In Brazil, Dr. Chao Lung Wen was one of the pioneers in disseminating information, through the Journal of Telemedicine and Telehealth, on government and academic actions related to the topic [1]. The consolidation of this practice is already being discussed internationally [2] and, in the national context, involved the creation of the Brazilian Council of Telemedicine and Telehealth and the structuring of the National Telehealth Program, with specific regulations focused on ethics and professional remuneration [3]. Telemedicine in Brazil is regulated and widely applied in the public and supplementary health systems, especially after the resolutions of the Federal Council of Medicine (CFM) No. 2,227/2018 and No. 2,314/2022 [4]. Telehealth encompasses several areas such as Teledentistry, Online Psychology, and Telepharmacy. However, Teledentistry faces regulatory and structural limitations that restrict its wider adoption [5,6].

Defined as the practice of Dentistry mediated by Information and Communication Technologies (ICTs), Teledentistry aims at the management, prevention, education, research, and promotion of oral health [7,8]. It is a tool that allows dentists to connect with patients digitally, optimizing treatment stages and expanding access to dental care. Studies such as those by Skelton-Macedo et al. [9,10] highlight relevant benefits of the practice, such as the creation of virtual clinics, encouragement of oral health education, professional marketing strategies, and greater interaction with patients. Additionally, the modality offers resources such as digital anamnesis, instant feedback, synchronous and asynchronous telecare, in addition to the need for legal and technological protection of clinical information.

With the advent of the COVID-19 pandemic, the practice of Teledentistry grew significantly between 2020 and 2022, motivating the publication, by the Ministry of Health, in Brazil, of a practical manual for its use in the Unified Health System (SUS) [11-13]. Resolution No. 226/2020 of the Federal Council of Dentistry (CFO) regulated dental telemonitoring, authorizing the remote monitoring of patients unable to attend in person [14]. Despite the progress, Kasuma et al. [15] identified a lack

of knowledge among dentists regarding the legal and operational aspects of Teledentistry, highlighting the need for professional training and awareness. From the patient's perspective, although there are inherent limitations to remote care compared to in-person care, there are also gains in access and agility, especially in hard-to-reach regions [16,17].

The development of digital solutions, such as remote care applications, has also gained prominence. Jacob [18] highlighted the importance of humanizing the use of these technologies, as well as the adaptation of professionals to the standards of the General Data Protection Law (LGPD). The pandemic scenario reinforced the importance of Teledentistry as a strategic tool in the face of crises, expanding its future viability in Brazil.

Teledentistry, as a practice integrated with telehealth, is a strategic tool for expanding access to oral health, professional training, and continuity of care [19,20]. This modality includes teleeducation, teleconsultation, telemonitoring, and teleguidance actions, and is regulated in Brazil by Law No. 5,081/66, the Dental Code of Ethics, and CFO Resolution No. 226/2020, which prohibits teleconsultations and teleprescriptions, but allows practices such as remote monitoring and exchange of information between professionals [21].

In Brazil, initial studies have demonstrated the potential of teledentistry in continuing education and technical support, as evidenced by projects implemented in the city of Belo Horizonte and at the Federal University of Minas Gerais (UFMG) [19,22]. Gonçalves et al. [23] highlighted the use of digital technologies in clinical documentation and dental radiology, emphasizing the importance of digital certification to ensure the legal validity of records.

The literature also emphasizes the need for adequate technological infrastructure and secure digital communication systems, as well as the importance of data encryption [16], patient confidentiality, and informed consent in the ethical management of digital health information [10]. The Brazilian experience with Telessaúde Brasil Redes [3,24] reinforces the role of Teledentistry in Primary Health Care, especially in remote areas. During the COVID-19 pandemic, Teledentistry gained relevance as a viable alternative to in-person care, promoting accessibility and safety. Ghai [25]

and Roxo-Gonçalves et al. [26] highlighted its impact on reducing referrals and travel. However, challenges such as resistance from professionals, highlighted by Migas et al. [27], and lack of knowledge of legal regulations, highlighted by Kasuma et al. [15], still persist.

Regarding clinical effectiveness, recent studies indicate that Teledentistry presents relevant diagnostic sensitivity and specificity, especially in caries monitoring and remote screening programs [28-30]. Kanani et al. [31] and Goffin et al. [32] highlight benefits such as continuous monitoring, anxiety management in pediatric patients, and increased access in vulnerable communities.

In Brazil, data protection and compliance with the General Data Protection Law (LGPD – Law No. 13,709/2018) are recurring aspects in the literature. Jacob et al. [8] and Garbin et al. [33] emphasize the need for adaptation of dental software and the judicious use of applications such as WhatsApp®, respecting patient confidentiality and consent.

Given this scenario, the literature indicates that, although teledentistry represents a promising innovation in contemporary dentistry, its full implementation depends on advances in infrastructure, training, regulation, and scientific validation. In this context, studies that explore the acceptance of technology by dentists become essential to guide strategies for the effective implementation of this practice. This study aimed to analyze the knowledge and interest of dentists concerning the use of specific teledentistry tools, considering their expansion. Inspired by the effectiveness of telemedicine in various medical specialties, the aim is to understand the receptiveness of dentistry professionals regarding the incorporation of these technologies into clinical practice, with a focus on improving the quality, accessibility, and safety of care. To this end, a questionnaire with open and closed questions was developed, based on Steve Blank's client development methodology in Ries [34], aiming to understand the real demand and the receptiveness of potential users to the proposal of this technology. This research sought to identify the level of familiarity of professionals with teledentistry, identify the advantages and disadvantages perceived in its clinical application, and relate variables such as age and time since training of the interviewees with acceptance or rejection of the technology.

MATERIAL AND METHODS

This is an observational, cross-sectional study with a quantitative approach. The research was approved by the Research Ethics Committee, through the Plataforma Brasil (CAAE: 77091224.4.0000.0077), respecting the principles of the Declaration of Helsinki and the General Data Protection Law (LGPD, Law No. 13,709/2018). All participants signed an Informed Consent Form (ICF), ensuring anonymity and confidentiality.

Data was collected between May and December 2024 at the Ortogeo - Center for Research and Specialized Studies institution, located in São José dos Campos (SP), Brazil. Dentists aged 18 or over, enrolled or working as teachers in the institution's specialization courses, were included. Professionals who did not graduate in dentistry or were under 18 years of age were excluded. A total of 205 questionnaires were delivered, comprising the final sample of 205 participants from various dental specialties and originating from different states in Brazil, as well as other Latin American countries, ensuring greater heterogeneity in the professional profiles analyzed.

The collection instrument was a structured questionnaire comprising six questions, developed based on Ries' [34] customer development approach, which combined open-ended and closed-ended questions, as shown in Table I. The questionnaire was previously validated through a pre-test (pilot test) with 50 professionals from the same institution, which allowed semantic adjustments and estimation of sample variability.

The questionnaires were administered in person at the Ortogeo institution during extension courses. The questions addressed age and year of graduation (Q1), prior knowledge of teledentistry (Q2), recognition of the use of WhatsApp as a telehealth tool (Q2a), perception of security on digital platforms (Q3), main advantages (Q4) and disadvantages (Q5) perceived, and interest in using a specific application according to the criteria of the LGPD and regulatory agencies (Q6). The table below presents the questions from the questionnaire used in this research.

The responses were organized in Microsoft Excel spreadsheets, and initially, a descriptive analysis was performed, with calculation of absolute and relative frequencies for categorical variables, in addition to mean, standard deviation, median,

Table 1 - Structure of the questionnaire applied to participating dentists

Question	Content	Response Type
Q1	Age of interviewee and year of undergraduate course completion	Open
Q2	Do you know what teledentistry is?	Dichotomous (Yes / No)
Q2a	Did you know that exchanging messages or images via a platform (e.g., WhatsApp®) with the patient is characterized as teledentistry? (Only displayed if Q2 = No)	Informative
Q3	Do you feel safe exchanging information with your patient through these platforms?	Dichotomous (Yes / No)
Q4	List two or three advantages of using teledentistry	Open (Essay response)
Q5	List two or three disadvantages of using teledentistry	Open (Essay response)
Q6	Would you be interested in using an application that complies with information security standards (LGPD) and regulatory bodies (CFO/SBIS)?	Dichotomous (Yes / No)

and interquartile range for continuous variables. The data were stratified by age groups (20-30, 30-40, 40-50, 50-60 years), allowing detailed characterization of the respondents' profile.

Subsequently, inferential analysis was performed to test associations between interest in using teledentistry applications and explanatory variables such as age, prior knowledge, use of WhatsApp, perception of safety, and number of perceived advantages. The following tests were used: Pearson's chi-square for categorical variables, Student's t-test for continuous variables with normal distribution, and Mann-Whitney test for nonparametric data. Normality was assessed using the Shapiro-Wilk test and homogeneity of variances with the Levene test. The significance level adopted was 5% ($p < 0.05$). Statistical analyses were performed using Jamovi software version 2.2.

The open-ended responses were subjected to qualitative thematic analysis, with manual coding. The categories were grouped into three conceptual axes: (i) Operability and Access: aspects related to ease, resource savings and expansion of care; (ii) Technical and Diagnostic Limitations: clinical and technical barriers to the adequate practice of telemedicine; and (iii) Ethical, Legal and Psychological Risks: concerns regarding safety, regulation and subjective experience of the patient and professional. This categorization was used to compose an analysis in semantic clusters, based on content similarity, complementing the statistical findings with conceptual interpretations aligned with the framework of the Technology Acceptance Theory [35].

RESULTS

A total of 205 responses were collected from dentists participating in the survey, with 100%

survey response rate. Descriptive analysis of the data showed that 64.88% of professionals stated that they were familiar with the concept of teledentistry, while 35.12% stated that they were not familiar with the topic, indicating the need for greater dissemination of information about the practice. Regarding the use of WhatsApp® as a teledentistry tool, 72.68% of participants recognized its role in this context, while 27.32% demonstrated a lack of knowledge, possibly related to limitations in access to technology or lack of awareness about the use of the application (Figure 1).

Regarding the security of information exchange through digital platforms, 54.15% of respondents reported feeling safe, while 45.85% expressed insecurity, indicating a significant concern about data protection and privacy in the digital environment (Figure 1).

Finally, 92.68% of participants expressed interest in using a specific tool for teledentistry that follows the LGPD standards and the criteria of regulatory bodies. This data reinforces the potential for acceptance of the technology, as long as it is supported by appropriate regulations and technical standards, as shown in Figure 1.

Figure 2 shows the distribution of data obtained from the questionnaire, relating prior knowledge about teledentistry, the perception of security in digital messaging exchanges, and the interest in using specific applications, according to the age group of the participants. In Figure 2a, it can be observed that 65% of the interviewees, regardless of age group, demonstrated familiarity with teledentistry. The responses regarding the perception of security in messaging platforms varied between age groups (Figure 2b). The ages between 20 and 30 years and between 40 and 50 years concentrated the highest proportion of negative responses (55% and 20%, respectively),

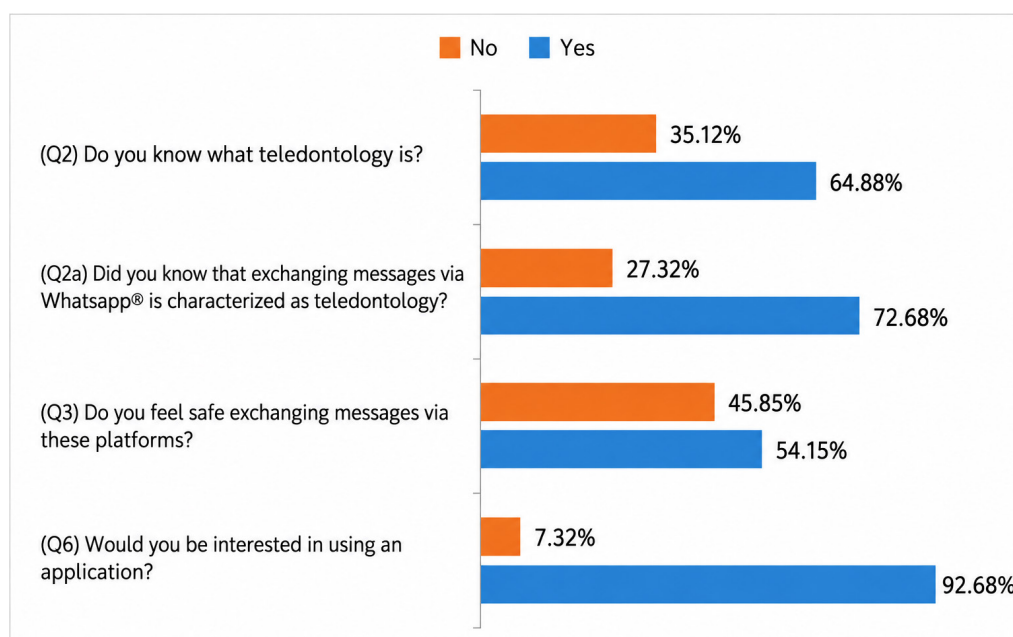


Figure 1 - Percentage results of the 'Yes' and 'No' answers for each of the three questions: (Q2) Do you know what teledentistry is?; (Q2a) Did you know that exchanging messages via Whatsapp® is characterized as teledentistry? (Q3) Do you feel safe exchanging messages via these platforms?; (Q6) Would you be interested in using an application that meets information security standards and regulatory agencies?

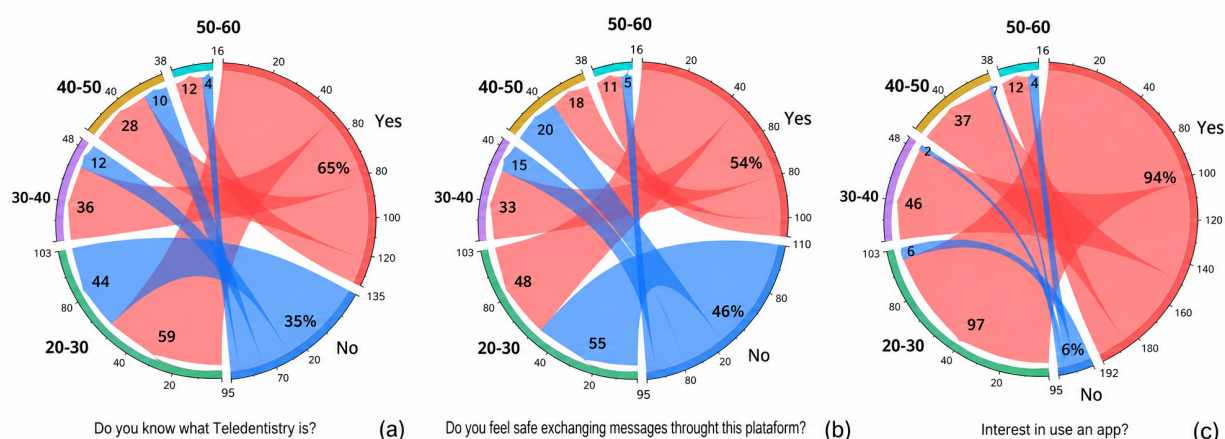


Figure 2 - Percentage ratio by age group in the different questions: 2a (Q2) Do you know what teledentistry is? 2b (Q3) Do you feel safe exchanging messages through these platforms? 2c (Q6) Interest in using APP?

while the age groups between 30 and 40 years and 50 to 60 years expressed a greater sense of security (33% and 11% of affirmative responses, respectively). Overall, 54% of the interviewees stated that they felt secure in using digital platforms to exchange information with patients, while 46% expressed insecurity. This result may reflect both familiarity with digital tools and growing concern about data protection laws and digital security. Interest in using specific applications for teledentistry was high across all age groups (Figure 2c), with 94% of affirmative responses predominating. This pattern indicates a strong receptiveness to the adoption of digital

technologies, as long as they meet the legal and security criteria required by professionals. There is also concern among professionals regarding the sharing of sensitive data on popular communication platforms, such as messaging applications, which do not offer full guarantees of confidentiality and protection. The use of these means can expose clinical information to risks of privacy violations, contravening the General Data Protection Law (Law No. 13,709/2018) and the Code of Dental Ethics, which reinforces the need to adopt specific applications for teledentistry, developed with appropriate security and confidentiality protocols.

Figure 3 presents an analysis of the responses to the three questions described in Figure 2, relating aspects of age groups and the year in which the interviewees completed their undergraduate studies. This representation allows us to identify patterns of knowledge, perception of security, and interest in technology among different age groups and periods of study:

Within the age range and year of completion, we obtained the following results:

- The 20-30 and 30-40 age groups are mostly associated with the most recent completion years (2003-2015 and 2015-2024), indicating individuals who are likely to have greater exposure and skills in digital technologies and understanding of related concepts, such as teledentistry.
- Participants in the 40 to 50 age range show a more diverse distribution between the years of completion (1991-2003, 2003-2015, and 2015-2024), reflecting different stages of exposure to new technologies.
- The age range of 50 to 60 years is distributed across all periods of graduation studied, and with a predominance in the period between 1991 and 2003, suggesting more recent familiarity with technological innovations in dentistry.

Data analysis was divided by age group, focusing on responses to questions Q2 (knowledge about teledentistry), Q3 (security in exchanging digital messages), and Q6 (interest in using a specific application). The results indicate important variations according to the age of the participants.

As shown in Table II, all age groups showed a higher proportion of affirmative responses regarding prior knowledge about teledentistry. The 30-40, 40-50, and 50-60 age groups stood out with more than 70% of respondents reporting knowledge about the topic, while the 20-30 age group showed a greater balance between positive (57%) and negative (43%) responses. These data suggest that there is prior knowledge about teledentistry; however, there is a need for educational actions on the topic aimed at professionals.

The data in Table II also indicates that the perception of security when exchanging messages varied between age groups. Participants aged 30 to 40 and 50 to 60 were the ones who most reported feeling safe (69% in both age groups). On the other hand, professionals aged 20 to 30 and 40 to 50 presented a higher proportion of insecurity, both with 53%, indicating the need for reinforcement of information on digital security and data protection. Across all age groups, there was a high interest in using a specific tool

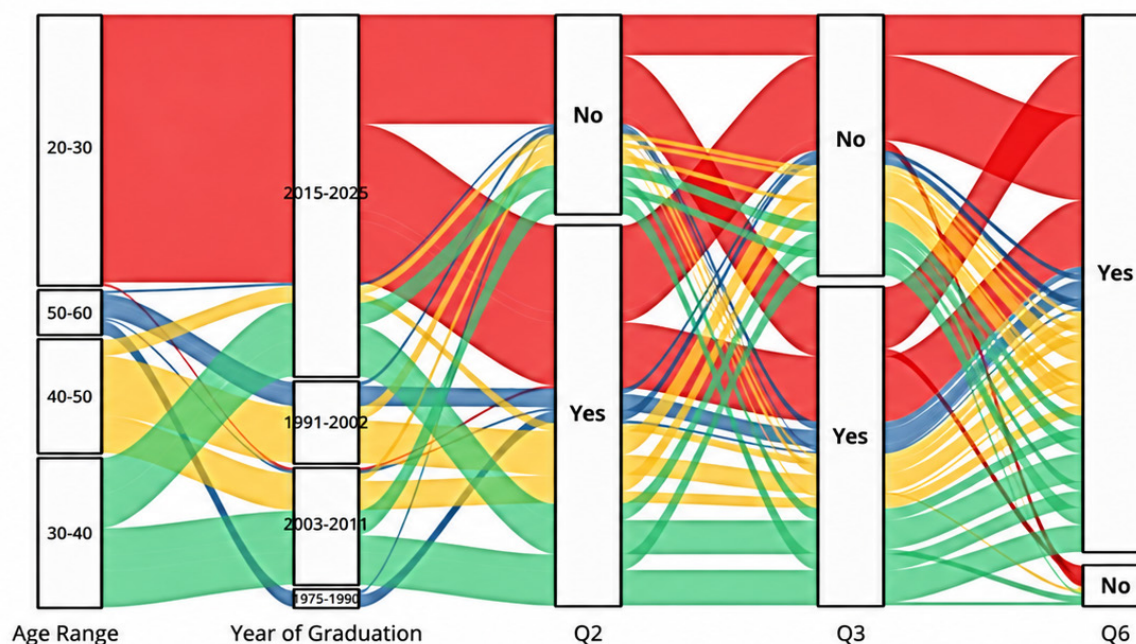


Figure 3 - Relationship between age group and year of course completion with the questions (Q2): Do you know what teledentistry is?; (Q3) Do you feel safe exchanging messages through these platforms?; (Q6) Interest in using APP?

Table II - Responses to Q2, Q3 and Q6

Question	Answer	Age and Sample							
		20 to 30 years		30 to 40 years		40 to 50 years		50 to 60 years	
		103		48		38		16	
Q2 Do you know what teledentistry is?	Answer = YES	59	57%	36	75%	28	74%	12	75%
	Answer = NO	44	43%	12	25%	10	26%	4	25%
Q3 Do you feel safe exchanging messages on these platforms?	Answer = YES	48	47%	33	69%	18	47%	11	69%
	Answer = NO	55	53%	15	31%	20	53%	5	31%
Q6 Would you be interested in using an application that complies with information security standards?	Answer = YES	97	94%	46	96%	37	97%	12	75%
	Answer = NO	6	6%	2	4%	1	3%	4	25%

for teledentistry. These results reiterate the objective of the study based on the fact that most participants demonstrated receptiveness to the adoption of new digital technologies.

Analysis of the associations between the explanatory variables and the interest in using applications in the field of teledentistry showed that interest in teledentistry applications was positively influenced by prior knowledge, younger age, and perceived advantages. In addition, WhatsApp users and those valuing secure messaging were more likely to adopt the technology (Table III).

In the answers to the essay questions, advantages and disadvantages of teledentistry were highlighted (Figure 4).

The comparative analysis of the advantages and disadvantages of teledentistry shows that respondents strongly value the agility and convenience provided by this type of care. The main advantage indicated was “speed, ease, and convenience”, cited by 79.5% of participants, reflecting the perception that teledentistry optimizes time and facilitates access to health services. Other relevant benefits included the possibility of solving problems remotely (26.8%) and the reduction of costs and service time (17.6%). These results suggest that users recognize the potential of teledentistry to increase clinical resolution and promote greater efficiency in patient care.

Additionally, instruction in emergency situations (15.6%), remote monitoring (13.2%), and the ability to plan before in-person care (10.2%) were mentioned as positive points. The patient being informed about the treatment and digital data storage also appeared among the advantages (10.2%), indicating that the

digitalization of information contributes to greater transparency and continuity of care. Although with more discreet percentages, aspects such as the provision of care at alternative times, assistance in remote areas, and communication between professionals reinforce the role of teledentistry in promoting access to dental treatment.

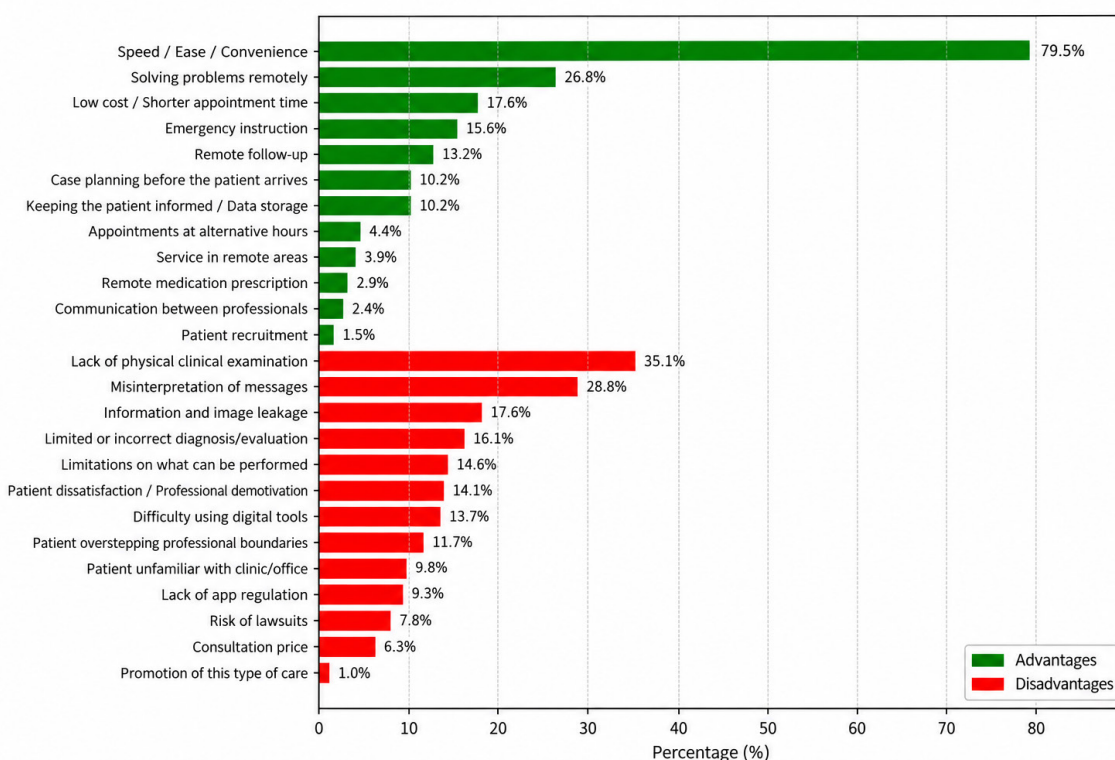
On the other hand, the main perceived limitations refer to the absence of a physical clinical examination, considered the greatest disadvantage (35.1%). This finding reveals a recurring concern with the limitation of remote diagnostic assessment, especially in situations that require direct physical examination. Next, the distortion in the interpretation of messages (28.8%) and the risk of information and image leaks (17.6%) stand out, factors that reinforce the importance of accurate communication and robust information security measures.

Other disadvantages identified included the limitation of procedures that can be performed remotely (14.6%), patient dissatisfaction (14.1%), and difficulty in using digital tools (13.7%). Additionally, problems related to ethics and regulation were mentioned, such as the lack of specific regulations (9.3%), as well as the risk of lawsuits (7.8%). These results indicate that, although teledentistry is well accepted in operational terms, there are still significant barriers regarding safety, technological capacity, and legal support.

Regarding the cluster analysis by thematic similarity based on the advantages and disadvantages reported by the interviewees, it was possible to highlight three clusters that reflect distinct dimensions of professional perception regarding the use of teledentistry (Figure 5).

Table III - Results of associations between explanatory variables and interest in using the app

Association	Statistical Parameter	p-value
Prior knowledge -v- Interest	$\chi^2 = 15.34$	0.0001
WhatsApp Usage -v- Interest	$\chi^2 = 22.89$	0.00001
Security in digital exchange -v- Interest	$\chi^2 = 13.79$	0.001
Age -v- Interest	$t = -4.12$	0.00007
No. of perceived advantages -v- Interest	$U = 1035.5$	0.00001

**Figure 4** - Main positive (advantages) and negative (disadvantages) points perceived in the practice of teledentistry, expressed as a percentage of occurrence.

The first cluster (cluster 1), related to operational efficiency and access, brings together elements that demonstrate the positive perception of dentists regarding the logistical gains, time savings, and expanded care coverage provided by remote care. This perception highlights the potential of teledentistry to overcome geographic, temporal, and economic barriers, especially benefiting primary care contexts and regions with less access to specialized services. In contrast, the second cluster (cluster 2) focuses on technical and diagnostic limitations, encompassing aspects that compromise the completeness of remote clinical care, such as the absence of a physical examination and difficulties in diagnostic accuracy. These limitations, highlighted by several participants, reinforce the notion that remote practice does not fully replace in-person care, and is more appropriate

when adopted in hybrid models that combine technology and direct clinical assessment. The third grouping (cluster 3) encompasses ethical, legal, and psychological concerns, reflecting concerns about information security, legal liability, and the subjective impact of digital practice on the professional-patient relationship. In this domain, participants expressed concerns about the misuse of clinical data, the lack of specific regulations, and the dehumanization of oral health care.

The articulation of the three axes in the cluster analysis reveals that, although teledentistry is perceived as an effective and promising tool to expand access and optimize processes (first cluster), this technology still faces significant obstacles both from a technical (second cluster) and legal and ethical (third cluster) point of view.

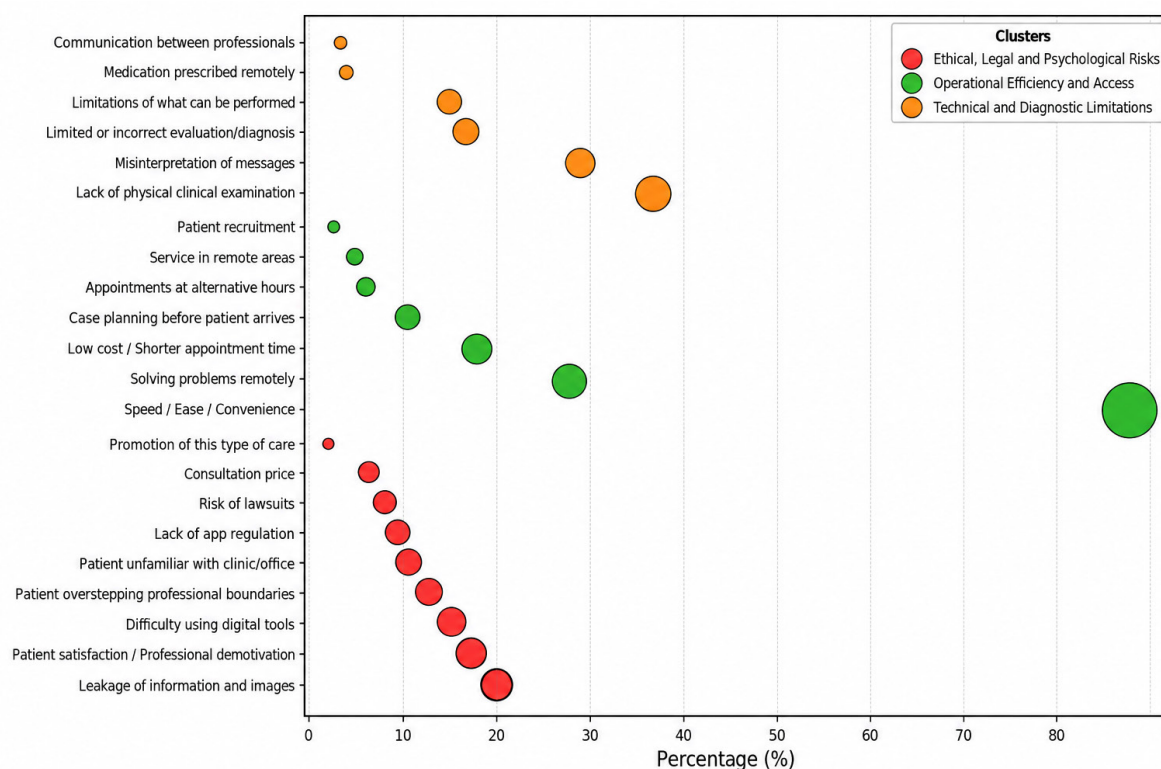


Figure 5 - Structure of latent conceptual clusters identified from the thematic analysis of the advantages and disadvantages of telemedicine. Each group represents a distinct dimension. Cluster 1 in green: Operability and Access (aspects related to efficiency, ease, and expansion of care). Cluster 2 in green and orange: Technical and Diagnostic Limitations (clinical and technological barriers that impact practice). Cluster 3 in red: Ethical, Legal, and Psychological Risks (concerns associated with safety, regulation, and patient and professional experience).

DISCUSSION

The application of a questionnaire with open and closed questions about teledentistry in a dental specialty center allowed the collection of relevant information about the professionals' interest and knowledge in the use of technology in their work environment. The age division highlighted how technological familiarity, time since graduation, and understanding of the topic influence the way these professionals view the advantages and limitations of this practice. In summary, the survey shows that teledentistry is widely recognized for its ability to streamline care, reduce costs, and facilitate access to oral health care, but its implementation faces structural, ethical, and clinical challenges. Overcoming these limitations requires investments in professional training, improvement of information and communication technologies, in addition to the consolidation of clear regulatory guidelines that guarantee legal security and clinical effectiveness in the digital context. Most participants stated that they were familiar with the concept of teledentistry, which indicates a reasonable level of familiarity with the topic, although a

smaller percentage still demonstrated a lack of knowledge. This data reinforces the need for training and dissemination strategies for the practice, especially considering its growth during and after the pandemic period [7,19].

The use of WhatsApp® as a teledentistry tool was recognized by professionals, demonstrating its widespread use in clinical routine. However, some respondents still did not associate the exchange of messages via apps with the practice of teledentistry, which may be related to the lack of specific training or the lack of regulatory clarity as discussed by Skelton-Macedo et al. [10] and Jacob [18]. These results also highlight a gap in the understanding of digital practices in oral health, which requires conceptual standardization and practical guidelines from professional boards.

The present study expanded the discussion regarding data security, confidentiality, and professional responsibility associated with the use of WhatsApp in teledentistry. Although WhatsApp offers end-to-end encryption for text messages, audio, and shared files, this protection is limited to data transmission and does not completely eliminate risks related to

unauthorized access, account cloning, phishing attacks, recovery of deleted messages, or insecure storage on personal devices and cloud backups. These concerns are particularly relevant because dental records are considered sensitive personal data under the Brazilian General Data Protection Law (LGPD), requiring strict standards for the collection, storage, sharing, and disposal of patient information. In addition, dentists remain ethically and legally responsible for maintaining patient confidentiality and complying with the regulations established by the Brazilian Federal Council of Dentistry (CFO), including the use of informed consent and secure management of digital records. Therefore, the adoption of measures such as two-factor authentication, biometric access control, exclusive professional devices, encrypted backups, and appropriate electronic documentation may contribute to safer and more ethically compliant use of messaging applications in teledentistry. Despite the practicality and widespread acceptance of WhatsApp among professionals and patients, its incorporation into healthcare services requires continuous evaluation of privacy and cybersecurity risks, especially with the ongoing expansion of teledentistry practices.

Regarding the perception of security in the use of digital platforms for clinical communication, more than half of the participants reported feeling safe, while just under half expressed insecurity. The significant margin of insecurity demonstrates the importance of compliance with the General Data Protection Law (LGPD – Law No. 13,709/2018) and the adoption of systems with encryption, authentication, and digital consent protocols [8,33]. This perception of risk can act as a limiting factor to the expansion of teledentistry, as predicted by the Technology Acceptance Theory [35], according to which perceived security directly influences the intention to use new tools.

Interest in using a specific teledentistry tool that is regulated and compatible with the LGPD was significant, with most participants responding positively. This result suggests a high predisposition to adopt it, as long as there are technical, legal, and ethical guarantees. The cross-referencing with sociodemographic data revealed significant variations. Professionals aged 30 to 60 years old showed greater knowledge on the topic, while younger professionals (aged 20 to 30 years old) showed less familiarity, although they are more exposed to digital technologies.

This contrast suggests that respondents aged 20 to 30 years old do not necessarily have greater technical knowledge, reinforcing the importance of continuing education and access to structured content during professional training [15].

Regarding security, the 30-40 and 50-60 age groups were those who reported the most confidence in digital exchanges. Professionals aged 20-30 and 40-50 expressed greater insecurity, which may indicate an effect of recent training without in-depth knowledge of digital legislation, or even a negative perception of digital insecurity (difficulties in protecting privacy, data leaks, and scams in the virtual environment). Familiarity with technological tools, combined with confidence in their security, proved to be decisive for the acceptance of teledentistry, as indicated by technology adoption models [36].

Interest in using apps was high across all age groups. Statistical analysis confirmed significant associations between prior knowledge, WhatsApp® use, feeling of security, and greater interest in adopting a specific app.

Furthermore, it was observed that the perception of advantages also directly influenced the interest in using the technology, reinforcing the TAM hypothesis according to which the perception of usefulness is one of the main predictors of the acceptance of innovations [35]. According to this model, the more the user believes that the technology can improve their professional performance, the greater their willingness to adopt it. Thus, the construction of tools that demonstrate operational, clinical, and communicational gains tends to favor their adoption among dental professionals [26].

In this study, the data obtained from the open-ended questions demonstrated a positive trend towards the incorporation of teledentistry into the daily routine of dentists, provided that this is supported by safety measures, regulatory clarity, and educational actions. The promotion of digital culture in oral health should consider the training profiles, age variations, and confidence levels of professionals to expand the ethical, safe, and effective use of this type of care.

The joint analysis of the responses to the closed questions revealed a consistent behavior: greater knowledge about the topic and a greater sense of security are positively associated with the interest in using a digital tool for teledentistry.

These findings reinforce the importance of developing technological platforms that guarantee the security and confidentiality of information, as well as carrying out educational campaigns to expand the reach and acceptance of these tools for more professionals in the dental field.

The analysis of the responses to the closed questions, segmented by age groups, allowed us to understand the different perceptions and levels of acceptance of teledentistry among dentists. The main advantages mentioned by the 20 to 30-year-old group involved ease of communication, speed of service, and convenience for the patient and the professional. These responses are in line with the considerations made by Teixeira et al. [37], Tella et al. [38], and Garbin et al. [33] when discussing the benefits of bringing oral health to the most remote areas, also generating this ease of communication and movement through Teledentistry. Additionally, these data may reflect the natural familiarity of professionals in the 20-30 age group with technological resources, in addition to a positive disposition towards the incorporation of digital innovations into clinical routine [25,28,39]. In the present research, even among young adults, disadvantages were reported, such as insecurity in data protection and difficulty in access or use by patients. These results are in line with [25,28,39] when reporting the need to understand the disadvantages associated with the use of teledentistry to ensure the creation of platforms with sensitive data protection rules and the awakening of a critical awareness about the practical and ethical challenges of implementing teledentistry.

The advantages highlighted by professionals aged 30 to 40 were the optimization of clinical time, remote care in specific situations, and the use of the tool as a complementary support to face-to-face care. The disadvantages highlighted were mainly related to aspects related to legal and operational uncertainty and limitations, such as inadequate centralization of information. The justifications mentioned the lack of clear regulations, uncertainty regarding the use of technology, and the need to simplify standards for patients and professionals. The lack of an integrated platform specifically aimed at teledentistry, the software systems currently available on the market, such as clinical applications, electronic medical record managers or communication tools, only cover isolated functionalities, such as exam recording, clinical history or message

exchange, without offering a complete and centralized solution for digital dental practice. In addition, the challenges regarding usability by patients should be highlighted, demonstrating that, despite the interest, there are still important barriers to be overcome for the full adoption of these tools. These responses are in line with the reports of Skelton-Macedo et al. [10], Jacob [18], Jacob et al. [8], Gonçalves et al. [23], and Islam et al. [16] when emphasizing the lack of software certification and the need for regulation of platforms and the signing of the informed consent form to protect both the patient and the dentist as limiting factors for the adoption of digital technologies in dental care.

In the 40 to 50 age group, there was a greater balance between mentions of the advantages and disadvantages of using teledentistry. Professionals in this group recognized the potential of teledentistry to streamline patient support and facilitate remote monitoring of cases, but also highlighted limitations of the technology, such as the impossibility of clinical evaluation without a physical examination, legal uncertainty, and technological dependence. These findings suggest a more cautious stance, possibly influenced by greater clinical experience and training before the digital era. Similarly, Kargozar and Jadidfard [29] and Goffin et al. [32] discussed these limitations and suggested integrating teledentistry with clinical practice so that one complements the other.

Finally, the 50 to 60 age group showed a more critical and conservative view regarding the adoption of teledentistry, highlighting the low familiarity with digital platforms, resistance to technological adaptation, and the absence of clear regulations. The advantages, on the other hand, were cited in a more generic way. This profile of professionals reinforces the need for specific training strategies to promote digital inclusion and legal security in the adoption of technologies. Kasuma et al. [15] surveyed 168 dentists with questionnaires applied before and after a virtual educational seminar, concluding that the majority of the interviewees lacked adequate information to understand the legal aspects related to teledentistry and suggested holding seminars and training to increase dentists' knowledge about legal issues in teledentistry.

The full and responsible implementation of care models based on teledentistry requires a systemic approach that simultaneously considers

operational efficiency, clinical safety, and regulatory compliance. In summary, the data indicates good receptivity to the practice among the professionals evaluated, particularly as a complementary strategy to face-to-face care. However, effective adherence is conditioned by the degree of technological familiarity of users, trust in the platforms used, and mastery of the ethical and legal standards that regulate professional practice in the digital modality. The findings of this research reinforce the need for continuous investment in training, regulation, and development of technological tools that guarantee the ethical, safe, and functional use of teledentistry in contemporary dental practice.

In general, the results indicate good reception of teledentistry, especially as a tool to support in-person care. However, effective adherence is related to technological familiarity, trust in the platforms, and knowledge of ethical and legal standards. Thus, the importance of continuing education programs, adherence to specialization courses, and exploration of this topic that should be addressed more frequently in scientific events, as well as the development of regulated, accessible, and safe tools that favor the ethical and effective incorporation of teledentistry into the clinical practice of dentists, is highlighted.

CONCLUSION

This study demonstrated that although most dentists recognize the importance of teledentistry, important gaps remain regarding its regulation and practical application. Interest in adopting digital tools was high, especially when associated with LGPD compliance, security, and technical support, while familiarity with technology and confidence in remote communication were key factors influencing acceptance. Reported advantages included faster communication, convenience, and optimization of clinical time, whereas concerns involved legal uncertainty, patient adaptation, and lack of clear regulations. Younger professionals showed greater acceptance of digital tools, while older professionals adopted a more cautious approach due to ethical and operational concerns. Overall, teledentistry was recognized as a valuable strategy to expand access to dental care and improve clinical management, although its broader adoption still depends on professional training, secure technological platforms, and clearer regulatory guidelines.

Acknowledgements

The authors would like to thank ORTOGEO – Center for Research and Specialized Studies for the institutional support and for providing the necessary infrastructure for the development of this study.

Data availability

Research data is only available upon request.

Author's Contributions

PRS, SR, LMCJ: Conceptualization. PRS, JKSF, LMCJ, MCSM, SR: Formal Analysis. PRS, SR, LMCJ: Investigation. PRS, SR, LMCJ, JKSF: Methodology. PRS, JKSF, LMCJ, MCSM, SR: Writing – Original Draft Preparation. PRS, JKSF, LMCJ, MCSM, SR: Writing – Review & Editing.

Conflict of Interest

No conflicts of interest declared concerning the publication of this article.

Funding

The authors declare that no financial support was received.

Regulatory Statement

The research was approved by the Research Ethics Committee through Plataforma Brasil (CAAE: 77091224.4.0000.0077), in accordance with the principles of the Declaration of Helsinki and the General Data Protection Law (LGPD, Law No. 13,709/2018). All participants signed an Informed Consent Form (ICF), ensuring anonymity and confidentiality.

REFERENCES

1. Wen CL. Telessaúde aplicada às estratégias de saúde do país. *Revista de Telessaúde e Telemedicina*. 2006;2(2).
2. Sood S, Mbarika V, Jugoo S, Dookhy R, Doarn CR, Prakash N, et al. What is telemedicine? A collection of 104 peer-reviewed perspectives and theoretical underpinnings. *Telemed J e-Health*. 2007;13(5):573-90. <https://doi.org/10.1089/tmj.2006.0073>. PMID:17999619.
3. Ferreira LAQ, Peixoto RTRC, Pinto RS, Pedrosa RR, Senna MIB. Segundas opiniões formativas em Saúde Bucal no Programa Telessaúde Brasil Redes. *J Bras Tele*. 2019;6(1):31-7.
4. Brasil. Conselho Federal de Medicina. Resolução CFM nº 2.314, de 20 de abril de 2022. Define e regulamenta a telemedicina como forma de prestação de serviços médicos mediados

- por tecnologias de comunicação. Diário Oficial da União [Internet]; Brasília; 2022 [cited 2026 May 12]. Available from: https://sistemas.cfm.org.br/normas/arquivos/resolucoes/BR/2022/2314_2022.pdf
5. Haddad AE, Skelton-Macedo MC. Teleodontologia na formação dos profissionais de saúde. In: Mathias IM, editors. Gold book: inovação tecnológica em educação e saúde [Internet]. Rio de Janeiro: EdUERJ; 2012 [cited 2026 May 12]. p. 173-206. Available from: <https://www.telessaude.uerj.br/resource/goldbook/pdf/12.pdf>
 6. Costa CB, Peralta FDS, Ferreira de Mello ALS. How Has Teledentistry been applied in public dental health services? An integrative review. *Telemed J e-Health*. 2020;26(7):945-54. <https://doi.org/10.1089/tmj.2019.0122>. PMID:31573410.
 7. Munhoz L, Silva Y, Chacharski J, Cordeiro SC No. O Telessaúde Brasil Redes no Sistema Único de Saúde: considerações práticas sobre o cuidado em saúde. In Monoz L, Watanabe P, Silva Y, editors. *Inovação em Saúde: Telessaúde e Teleodontologia: conceitos e aplicações*. Ribeirão Preto: FORP/USP; 2023.
 8. Jacob LMC, Costa FC, Silva CS, Skelton-Macedo MC, Rodgher S. Teledentistry in Brazil and the challenges of digital certification. *International Journal of Clinical Studies and Medical Case Reports*. 2025;49(1). <https://doi.org/10.46998/IJCMCR.2025.49.001202>.
 9. Skelton-Macedo MC, Antoniazzi JH. The benefits and newly required practices brought about by innovations in the communication between professionals. *Braz Oral Res*. 2009;23(2):99-100. <https://doi.org/10.1590/S1806-83242009000200001>. PMID:19684940.
 10. Skelton-Macedo MC, Jacob CH, Ramos DLP, Cardoso RJA, Antoniazzi JH. Teleodontologia: valores agregados para o clínico/especialista. *Revista Associação Paulista Cirurgões Dentistas*. 2012;66(2):95-104.
 11. Cruz SPF, Moreno AGUT, Bezerra AGV, Guimarães BDB, Gerbi MEMM, Menezes MRA. Os benefícios e as limitações da teleodontologia em tempos de pandemia de COVID-19. In: *II Congresso Nacional de Inovações em Saúde (CONAIS)*. Fortaleza: Sociedade Cearense de Pesquisa e Inovações em Saúde; 2021.
 12. Tonkaboni A, Ziaei H, Rezaei N. Teledentistry during COVID-19. *Int J Clin Pract*. 2021;75(12):e15013. <https://doi.org/10.1111/ijcp.15013>. PMID:34965655.
 13. Alotaibi S, Alshehri A. Teledentistry approaches for dental assessments and consultation during the COVID-19 pandemic. *Smart Homecare Technol Telehealth*. 2022;9:11-25. <https://doi.org/10.2147/SHTT.S366239>.
 14. Brasil. Conselho Federal de Odontologia. Resolução CFO-226, de 04 de junho de 2020. Diário Oficial da União [Internet]; Brasília; 2020 [cited 2026 May 12]. Available from: <http://sistemas.cfo.org.br/visualizar/atos/RESOLU%C3%87%C3%83O/SEC/2020/226>
 15. Kasuma N, Nurwidayastuti P, Daulay Z, Sumantri D, Nismal H, Ernesto G. Knowledge of legal aspects in teledentistry among dental practitioners in Padang, West Sumatra, Indonesia. *Open Dent J*. 2023;17(1):e187421062302140. <https://doi.org/10.2174/18742106-v17-230302-2022-76>.
 16. Islam MRR, Islam R, Ferdous S, Watanabe C, Yamauti M, Alam MK, et al. Teledentistry as an effective tool for the communication improvement between dentists and patients: an overview. *Healthcare (Basel)*. 2022;10(8):1586. <https://doi.org/10.3390/healthcare10081586>. PMID:36011243.
 17. Silva VAN, Cunha RO, Leite ICG. Pandemia de COVID-19 e aplicabilidade da teleodontologia na atenção primária à saúde a partir de experiências internacionais. *Revista Ciência Plural*. 2022;8(2):e26130.
 18. Jacob L. O uso da teleodontologia através do desenvolvimento de um aplicativo no monitoramento de pacientes em tratamento. São José dos Campos (SP): Universidade Estadual Paulista; 2022.
 19. Moraes IM, Vieira PA, Pedreira JDBG, Pedreira EN. Teleodontology and oral health: challenges and perspectives. *Health and Society*. 2022;2(1):406-17. <https://doi.org/10.51249/hs.v2i01.673>.
 20. Correia ADMS, Dobashi BF, Goncalves CCM, Miranda FR, Monreal VRFD, Borsoi MB, et al. Telenfermagem e teleodontologia: relato da experiência do Telessaúde Brasil Redes em Mato Grosso do Sul. *Convibra*. 2012;10:1-12.
 21. Brasil. Conselho Federal de Odontologia. Guia de Esclarecimento sobre exercício da odontologia a distância [Internet]. Brasília: CFO; 2020 [cited 2026 May 12]. Available from: <http://website.cfo.org.br/tag/resolucao-226-2020/>
 22. Peixoto RTRC, Lucas SD. Programa de teleodontologia da UFMG. *Revista da ABENO*. 2011;11(1):71-5. <https://doi.org/10.30979/rev.abeno.v11i1.43>.
 23. Gonçalves P, Dotta E, Serra MRGO. Imagiologia na odontologia e aspectos legais. *Rev Gaucha Odontol*. 2011;59:89-95.
 24. Piropo TGN, Amaral HOSA. Telessaúde, contextos e implicações no cenário baiano. *Saude Debate*. 2015;39(104):279-87. <https://doi.org/10.1590/0103-110420151040413>.
 25. Ghai S. Teledentistry during the COVID-19 pandemic. *Diabetes Metab Syndr*. 2020;14(5):933-5. <https://doi.org/10.1016/j.dsx.2020.06.029>. PMID:32593116.
 26. Roxo-Gonçalves M, Stürmer VM, Santos LFD, Kinalski DDF, Oliveira EBD, Roman R, et al. Synchronous telephone-based consultations in teledentistry: preliminary experience of the telehealth Brazil platform. *Telemed Rep*. 2021;2(1):1-5. <https://doi.org/10.1089/tmr.2020.0007>. PMID:35720762.
 27. Migas K, Kozłowski R, Sierocka A, Marczak M. Evaluation of teledentistry and face-to-face appointments during the provision of dental services in Poland. *J Pers Med*. 2022;12(10):1640. <https://doi.org/10.3390/jpm12101640>. PMID:36294779.
 28. Kajal K, Mohammadnezhad M. Application of teledentistry and digital platforms during the COVID-19 pandemic among dentists in Fiji: A qualitative study. *Digit Health*. 2023;9:20552076231159191. <https://doi.org/10.1177/20552076231159191>.
 29. Kargoza S, Jadidfard MP. Teledentistry accuracy for caries diagnosis: a systematic review of in-vivo studies using extra-oral photography methods. *BMC Oral Health*. 2024;24(1):828. <https://doi.org/10.1186/s12903-024-04564-4>. PMID:39039499.
 30. Al-Buhaisi D, Karami S, Gomaa N. The role of teledentistry in improving oral health outcomes and access to dental care: an umbrella review. *J Oral Rehabil*. 2024;51(11):2375-89. <https://doi.org/10.1111/joor.13836>. PMID:39138933.
 31. Kanani H, Khubchandani M, Dangore-Khasbage S, Pandey R. Teledentistry: A Comprehensive Review and Its Application in Pediatric Dental Care. *Cureus*. 2024;16(1):e52685. <https://doi.org/10.7759/cureus.52685>. PMID:38384649.
 32. Goffin G, Carter N, Sari Widyarman A, Erri Astoeti T, Kabir Bulbul H, Puplampu P, et al. Role of teledentistry in enabling improved oral care outcomes. *Br Dent J*. 2024;236(3):162-8. <https://doi.org/10.1038/s41415-024-7055-y>. PMID:38332075.
 33. Garbin AJI, Pacheco AC Fo, Pacheco KTS, Garbin CAS. O uso de WhatsApp® na relação dentista-paciente: uma revisão de literatura. *Rev Bras Odontol Leg RBOL*. 2019;6(3):73-81. <https://doi.org/10.21117/rbol.v6i3.279>.
 34. Ries E. The lean Startup: how today's entrepreneurs use continuous innovation to create radically successful businesses. New York: Crown Business; 2011.

35. Silva PM, Dias GA. Teorias sobre aceitação de tecnologia: por que os usuários aceitam ou rejeitam a tecnologia da informação? BRAJIS. 2008;1(2):69-91. <https://doi.org/10.36311/1981-1640.2007.v1n2.05.p69>.
36. Davis FD. Perceived usefulness, perceived ease of use, and user acceptance of information technology. Manage Inf Syst Q. 1989;13(3):319-40. <https://doi.org/10.2307/249008>.
37. Teixeira CNG, Rodrigues MIQ, Frota LMA, Frota MMA, Oliveira AEF. Panorama situacional da Teleodontologia no mundo: uma revisão integrativa. Revista da ABENO. 2018;18(3):24-34. <https://doi.org/10.30979/rev.abeno.v18i3.455>.
38. Tella AJ, Olanloye OM, Ibiyemi O. Potential of teledentistry in the delivery of oral health services in developing countries. Ann Ib Postgrad Med. 2019;17(2):115-23. PMID:32669987.
39. Kumar YS, Kumar SV, Abhinav TN, Pentapati KC, Siddiq H. Challenges with use of an intra-oral camera for teledentistry in research and practice. International Journal of Research in Pharmaceutical Sciences. 2020;11(1):1861-6. <https://doi.org/10.26452/ijrps.v11i1.2979>.

Priscila Rodrigues da Silva
(Corresponding address)

Universidade Estadual Paulista, Instituto de Ciência e Tecnologia, São José dos Campos, SP, Brazil.
Email: priscila.rodrigues-silva@unesp.br

Editor-in-chief: Sergio Eduardo de Paiva Gonçalves

Editor: Leonardo Marchini

Date submitted: 2026 Jan 14

Accept submission: 2026 May 26