

# Acceptance of teledentistry by Brazilian dentists

## Abstract

The aim of this study was to investigate the opinions of Brazilian dentists regarding the use of Teledentistry. The instrument used was a closed response-based questionnaire consisting of 17 questions. The questionnaire was given to 227 professionals in the five macro-regions of Brazil. The research was approved by the Ethics in Research committee at the State University of Rio de Janeiro. The results indicated that most dentists were interested in using the resources of Teledentistry (81.0%). However, only 11.5% of the dentists had access to such technology. The supposed high cost of the technology was cited by 60.3% of the respondents as negative factors associated with the use of Teledentistry. The overall conclusion shows that Teledentistry resources and its costs must be more widely promoted in Brazil, for dentists and their patients to fully benefit from this emerging tool.

**Keywords:** telemedicine, telecommunications, telehealth, diagnostic services, health services

Volume 3 Issue 1 - 2015

Groisman S,<sup>1</sup> Olival R,<sup>2</sup> Sampaio Filho H,<sup>3</sup> Corvino M,<sup>2</sup> Toledo E,<sup>2</sup> Hidalgo Ricardo,<sup>4</sup> Senna M,<sup>5</sup> Gouveia C,<sup>5</sup> Miguel C<sup>6</sup>

<sup>1</sup>Department of Preventive Dentistry, Federal University of Rio De Janeiro, Brazil

<sup>2</sup>Master of Dentistry, Federal FLuminense University, Brazil

<sup>3</sup>Pos Graduation Course of Dentistry, Estadual University of Rio de Janeiro, Brazil

<sup>4</sup>Department of Dental Clinic, Federal Fluminense University, Brazil

<sup>5</sup>Pos Graduation Course of Dentistry, Federal University of Niteroi, Brazil

<sup>6</sup>Pos Graduation Course of Dentistry, Federal University of Rio De Janeiro, Brazil

**Correspondence:** Groisman S, Department of Community Dentistry, Federal University of Rio de Janeiro, Brazil, Tel +5521988069715, Email sonia@dentistas.com.br

**Received:** September 09, 2015 | **Published:** October 30, 2015

## Introduction

Telehealth was first used as communication and information in a distance, to transfer medical informations, in diagnostic process, continued education, due its rapid access, no matter where the patient is.<sup>1</sup> With the developing of electronic communications, the principal world organizations: World Health Organization (WHO); European Union (EU), International Telecommunications Agencies (ITA) and Spacial European Agency (SEA), adopted officially "eHealth" (eHealth), as an official term, after that turning point different health professions started to use the telehealth, for clinical; administrative and educational tools in health.<sup>2</sup> The reflection of the use of technology of information (TIs) in public service, has stimulated the dialogue between different social actors, compromise with the quality and resolutivity of health care. In Brazil, telehealth was created by Minister of Health in 2007.<sup>3</sup> The most common use of telehealth is related to diagnostic; planning individual and collective strategies, related to family strategy second opinion and continued education.<sup>4-6</sup>

It is important to have in mind that telehealth, should be used in a large spectrum. As health, is directly related to oral health. Periodontal infections contributes to the pathogenesis of atherosclerosis and thromboembolic events by promoting repeated systemic vascular changes resulting from the presence of endotoxin, such as lipopolysaccharide (LPS), inflammatory cytokines, including tumor necrosis factor (TNF) and interleukins which can induce the secretion of acute-phase proteins, such as C-reactive protein (CRP) and fibrinogen.<sup>7,8</sup>

One of the mechanisms in which diabetes is regarded as a risk factor for the occurrence and severity of periodontal disease, is its production of tumor necrosis factor (TNF -alpha) production, which

prevents the bone tissue to repair.<sup>9</sup> Many studies have demonstrated that control of periodontal infection can improve the diabetic glycemic control.<sup>10</sup> In the last two decades there is evidence that support the concept that Periodontal Disease can have adverse effects on organs and tissues in remote locations, being the major causes of cardiovascular and cerebrovascular diseases, diabetes and preterm birth.<sup>11,12</sup>

From the introduction above it is fair to evaluate the use of telehealth in dentistry, teledentistry, from the dentists point of view, in order to identify if Brazilian dentists were ready to use teledentistry as a second opinion as well in continuing education.

Teledentistry is a relatively new field that combines telecommunication technology and dental care.<sup>13</sup> In recent years, the use of computers and the advancement of informatics have generated interest in the ability to generate three-dimensional images in a high resolution. Computed Tomography Cone Beam (CTCB) was successfully introduced a third dimension to Dentistry. This equipment has a great precision and the large scale use of scans and all kind of digital X-ray images, created the need to share these information's among professionals, students and patients.<sup>14-16</sup> These were achieved by the Teledentistry.<sup>17,18</sup>

This tool might be used on a large scale in rural communities, increasing patient access to experts and reducing costs and time of travelling. The Brazilian Ministry of Science and Technology, together with São Paulo University, adopted the Teledentistry, thought Virtual Man Project, but there is still a great resistance by Brazilian dentists.<sup>18</sup>

Teledentistry could be used not only to increase access to dental care, but also in dental education, as self-instruction and interactive video conferencing, making continuing education more viable for both

for dentists and students.<sup>13</sup> Besides good advantage of Teledentistry, it needs good telecommunications network for rapid access to information, no matter how large the geographic separation between states or countries is.<sup>19,20</sup> As noted above, this tool allows dental care to extend to patients in remote areas at a reasonable cost. In view of the applicability and relevance of Teledentistry in the oral health practice, this study analysed the opinions and attitudes of Brazilians dentists regarding the implantation Teledentistry and its ability to be update is technological innovations.

## Material and methods

The present study was segmented into two parts: the first based on literature review with the myths, realites, perception and acceptance of Teledentistry in dentistry. Database Lilacs, Bireme, scientific articles were consulted, of which 53, served as the structural basis for theoretical and structural reasons, this dissertation. The second part was employed a closed response-based questionnaire that addressed the knowledge and use of Teledentistry by dentistry professionals (**Annex 1**). The questionnaire was adapted from the Telemedicine Satisfaction and Usefulness questionnaire<sup>17</sup> and consisted of 17 objective questions translated to Portuguese language. The kappa coefficient was applied to assess the reliability of the questionnaire by comparing agreement between the scores with the scores from a pre-test questionnaire. The kappa agreement value was 0.77, showing good reliability. The study was approved by the Ethics in Research committee at the State University of Rio de Janeiro (UERJ), and all dentists signed a free consent form. The questionnaire was given on a voluntary basis to dentists (n=227) who were participating in continuing education courses. They were randomized selected by congresses in the five Brazilian macro-regions supported by the National Brazilian Association of Dentistry Congresses. There were:

1. IV International Dental Congress of Santa Catarina, 2009;
2. XII Dental Congress of Espírito Santo, Apr / 2009;
3. XIII International Congress of Federal district (Brasília), Mar / 2009;
4. XV Brazilian Association of Dental Radiology's Congress, Rio De Janeiro, Nov / 2008;
5. 26th International Dental Congress of São Paulo, Jan / 2008;
6. 18th International Dental Congress in Rio de Janeiro, in 2009.
7. International Dental Congress of Mato Grosso do Sul, 2009;
8. International Dental Congress of Paraíba, in 2009.

Inclusion criteria: Be Surgeon Dentist, be enrolled in Congress of ABO- National in different provinces and/or be a dentist's National SESC, seeking thus a national sample.

After determining the percentage of each response to each question, Cross tabulation analysis was performed to reveal the relationship between the responses to certain question pairs. The Chi-Square test was then performed to evaluate the statistical significance of the cross tabulation. A p-value of <0.001 was regarded as highly statistically significant.

## Results

Participants were distributed among the five official Brazilian macro-regions, as follows: Southeast region 47.6%; Central-west

region 32.6%; Northeast region 7.9%; South region 7.0%; and North region 4.8%.

The most important aspects of the results were described below. It's important to highlight the fact that in some questions respondents were able to give more than one answer, because the categories were not mutually exclusive and one respondent could have multiple answers, thus allowing totals to be >=100%. Concerning the wish to use Teledentistry, 184 out of 227 (81.1%) dentists described their wish to use this technology, while 43 (18.9%) did not wish to use it. The majority of the dentists, 168 out of 227 (74.0%), thought that the use of Teledentistry would assist them to make better decisions about patient care, while 59 (26.0%) did not believe that this would be the case. As a limiting factor of the use of Teledentistry, the most prevalent result, chosen by 137 (60.3%) of the respondents, was the considered high cost of this tool. Other factors included were the lack of available technology (chosen by 94, or 41.4% of the respondents); the lack of qualified human resources (94, 41.4%); the high complexity of use (69, 30.3%); resistance of clinicians to new technology (61, 26.8%); the time required to learn and/or implement the technology (60, 26.4%); the quality of the technology (57, 25.5%); the lack of specialized consultants (51, 22.4%); inappropriate fees and compensation (42, 18.5%); and other unspecified reasons (9, 4.0%).

The results demonstrated that even though the majority of the dentists believed that patients and professionals alike would approve of the use of Teledentistry, and that the majority of the dentists were open to new ideas and already used computers and the internet as a matter of routine, only a minority (11.5%) used Teledentistry in their practice. Moreover, 60% justified this fact by the high cost of the technology.

Cross tabulation analysis was performed to reveal the relationship between responses to specific question pairs. The Chi-Square test demonstrated a statistically significant ( $p<0.001$ ) association between question 6 (Would patients accept the use of teledentistry?) And question 7 (Would dentists approve the use of teledentistry?) and questions 2 (Will the use of Teledentistry update your knowledge?) and 17 (Which technologies of information and communication do you use?). No significant association was shown between questions 14 (Are you a professional concerned to offer treatment of quality to your patients?) and 16 (Have you ever had the opportunity to use the teledentistry in your practice?) and questions 15 (Are you a professional opened to new ideas?) and 16.

## Discussion

The legal aspects of Teledentistry are still under examination in Brazil and there are not experiences of other countries. In the meantime, the direction is toward its acceptance and increasing use. However, according to Golder et al.,<sup>5</sup> Telemedicine as well Teledentistry are new fields that have not progressed in the uniform manner that is required for their infiltration into even the remotest areas, without any technical shortcomings that could prevent access to dental appointments. Despite these difficulties, Teledentistry has enormous potential to increase access to dental treatment while decreasing the cost of dental care, despite the fear of many dentists to the contrary. These important advantages are expected to encourage both the population at large, as well dentists in particular, to adopt the use of Telemedicine and Teledentistry to definitively integrate health care practices.<sup>5</sup>

The results of this study, showing the resistance in the use of Teledentistry by Brazilians can be compared with the recent systematic

review of Marino et al.,<sup>21</sup> which indicates that although teledentistry is an area of expansion, there are still some barriers to its increased use.

In case of Telemedicine, Whitten et al.,<sup>20</sup> evaluated its cost/benefits in a literature review. From 612 studies originally surveyed, 55 were selected. Of these, 44% evaluated the quality of Telemedicine, and 83% evaluated its costs. The evaluation of this discipline, in comparison with conventional treatment, has demonstrated the need for disseminating knowledge about the scientific basis of Telemedicine/Teledentistry, both to doctors or dentists and to municipal health coordinators. It is necessary to emphasize that the implementation of Teledentistry will not de-humanize dental practices. In addition, such implementation will be associated with lower costs than the conventional system's, which relies on in-person visits with specialists.<sup>6,20,22</sup>

The ability to obtain assistance with health care issues in the environment provided by cyberspace allows a professional to obtain a second opinion or a specialized opinion and to discuss diagnoses and treatment plans with a wide range of other professionals, regardless of their location. The aim of Telemedicine/Teledentistry is to optimize the diagnostic process and to advance scientific knowledge. Second opinions aid dentists and health care professionals to solve complex cases, and Telemedicine removes the need for the specialist and the general clinicians to be in close proximity. The simulation of clinical cases also advances the qualification of the health professionals to attend to real-life situations, through the presentation of problems and solutions, as well as case follow-up scenarios.<sup>23</sup>

The results of the present study can be compared with the results of Alencar.<sup>23</sup> The investigators gave a questionnaire to graduate students, postgraduate students and teachers of Dentistry to evaluate the accessibility of Teledentistry provided by the Virtual Man Program of the Telemedicine Discipline. All respondents said that they enjoyed the Teledentistry approach and active participation in the learning process. The analyses of three-dimensional data transmitted by video had an acceptance rate of 98.8%.

According to IlaraHämmerli-Moraes, the coordinator of the Telehealth program at the National School of Public Health (ENSP), telehealth in different areas and in a multiprofessional use, has led toward a new challenge: the insertion of technology and innovation into the Public Health System in Brazil. Telehealth involves health promotion, disease prevention, epidemiologic evaluation and health regulations. Telehealth is assuming a growing importance in Brazil due to the health benefits to the populace and the ability to rapidly exchange knowledge, no matter what the locale of the patient and the health professional. Furthermore, Telehealth, and Teledentistry with it, aids in the expansion of the dynamic economic market of health equipment and hospital services.<sup>24</sup>

## Conclusion

Knowledge about Teledentistry has been increasing in Brazil, together with the development of Telemedicine. It is recognized as an important instrument that allows rapid communication between health professionals in spite of the physical barriers that may separate them. Clinically, Teledentistry allows reinforcement of the correct treatment plan in its entirety, as well as more rapid diagnosis and treatment of patients located in remote areas.

Continued education about Teledentistry is available to interested students and professionals. However, most of the professionals interviewed, despite being interested in Teledentistry, had never had

access to it. This issue, along with the fact that most professionals already had a computer when interviewed and routinely used the internet, demonstrates a lack of knowledge with regard to Teledentistry. For example, respondents expressed concern about the high cost of the technology when, in fact, several studies have emphasized its comparatively low cost. Teledentistry can extend care to underserved patient populations, such as those in rural areas, at a reasonable cost. Teledentistry provides an opportunity to supplement traditional teaching methods in dental education, and will provide new opportunities for dental students and dentists.

Teledentistry must be more widely promoted as an important tool to improve health practices and bring the associated benefits to patients and professionals alike.

## Acknowledgment

The authors wish to thank the collaboration of master course of Dental Clinic from Fluminense Federal University that turned this research possible.

## Conflicts of interest

The author declares there are no conflicts of interest.

## References

- Monteiro AMV, Anderson MIP, Junior MJ, et al. The State of Rio de Janeiro, the Faculty of Medical Sciences of the State University of Rio de Janeiro and the Family Health Strategy: Experiences in Telemedicine and Telessaude. In: UFMG E, Editor. *Telessaude: an instrument of assistance support and permanent education*. Belo Horizonte; 2006.
- Aas IHM. A qualitative study of the organizational consequences of telemedicine. *J Telemed Telecare*. 2001;7(1):18–26.
- Brazil. Ministry of Saude Department of Basic Attention Saude da Familia. Internet. 2004.
- Aarts J, Peel V, Wright G. Organizational issues in health informatics : A model approach. *International J Med Informatics*. 1998;52:235–242.
- Golder DT, Brennan KA. Practicing dentistry in the age of telemedicine. *J Am Dent Assoc*. 2000;131(6):734–744.
- Olival ARB, Curvino M, Faria M, et al. New horizons in dentistry-Teledentistry. *Perionews*. 2008.
- Sinegalia AC, Nassar CA, Nassar PO, et al. Interrelationship of periodontal diseases and cardiovascular diseases. *Medcenter*. 2007.
- Weidlich P, Cimoes R, Pannuti CM, et al. Association between periodontal diseases and systemic diseases. *Rev Braz Oral Res*. 2008;22:32–43.
- Graves DT, Liu R, Alikhani M, et al. Diabetes-enhanced inflammation and apoptosis-impact on periodontal pathology. *J Dent Res*. 2006;85:15–21.
- Mealey BL, Osts TW. Diabetes mellitus and periodontal diseases. *J Periodontol*. 2006;77:1289–1303.
- Feres M, Figueiredo LC. From focal infection to Periodontal Medicine. *Rev Periodontia*. 2007;17:14–20.
- Offenbacker S, Jared H, O'Reilly P, et al. Potential pathogenic mechanisms of periodontitis associated pregnancy complications. *Ann Periodontol*. 1998;3(1):233–250.
- Chen JW, Ho dell MH, Dunn K, et al. Teledentistry and its use in dental education. *J Am Dent Assoc*. 2003;134(3):342–346.
- Cavalcanti MG. Face Image Diagnosis. 1st ed. 2008.

15. Noorani HZ, Picot J. Evaluation of telehealth videoconferencing in Canada. Canadian Coordination Office of Health Technology Assessment. 2001.
16. Whaites E. Principles of Dental Radiology. 3rd ed. 2003.
17. Gagnon MP. Psychosocial and Organizational Determinants of the Adoption of Telemedicine Technologies in the Quebec Extended Telehealth Network (RQTE). Laval-Quebec University. 2003.
18. Sanches DE, Lefebvre C, Abeyta K. Teledentistry in the United States: a new horizon of dental care. *J Calif Dent Assoc.* 2003;8:601–618.
19. Robinson DF, Savage GT, Sydow Campbell K. Organizational learning, diffusion of innovation, and international collaboration in telemedicine. *Health Care Manage Rev.* 2003;28(1):68–78.
20. Whitten PS, Mair FS, Haycox A, et al. Systematic review of cost effectiveness studies of telemedicine interventions. *Int J Dent Hyg.* 2003;4:161–164.
21. Marino R, Ghannim A. Teledentistry: a systematic review of literature. *J Telemed Telecare.* 2013;19(4):179–183.
22. Whitten P, Adams I. Success and failure: A case study of two rural telemedicine projects. *J Telemed Telecare.* 2003;3:125–129.
23. Alencar CJF. Content evaluation and learning object of Teleodontology applied to anesthesia and extraction in Pediatric Dentistry. USP; 2008.
24. Moraes IHS. Telessaede: A new field under development at ENSP. *Internet interview.* 2010.