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National analysis of dental teleconsulting of the Brazilian Telehealth Program

Lígia Cristelli PAIXÃO[a]
Efigênia Ferreira FERREIRA[b]
Antônio Paulino RIBEIRO-SOBRINHO[c]
Renata Castro MARTINS[b]

[a]Universidade Federal de Minas Gerais – UFMG, School of Dentistry, Belo Horizonte, MG, Brazil.

[b]Universidade Federal de Minas Gerais – UFMG, School of Dentistry, Department of Community and Preventive Dentistry, Belo Horizonte, MG, Brazil.

[c]Universidade Federal de Minas Gerais – UFMG, School of Dentistry, Department of Restorative Dentistry, Belo Horizonte, MG, Brazil.

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Corresponding Author:
Renata Castro Martins
E-mail: rcmartins05@gmail.com

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Abstract: This cross-sectional study nationally evaluated asynchronous dental teleconsulting services offered by the Telehealth Brazil Networks Program, using the 2019 Telehealth Results Monitoring and Evaluation System database and considering Brazilian regional differences. The following teleconsulting variables were collected: dentist's sex and specialty, date/time of question and answer, response time; dental specialty, professional satisfaction, and patient referral. Five Brazilian regions were socioeconomically characterized according to the Human Development Index, estimated population, Gini coefficient, coverage of dental specialty centers, oral health teams in Family Health Strategy, and oral health teams in primary health care (PHC). In total, 2,703 teleconsulting sessions occurred in Brazil in the analyzed period. The Southeast exhibited the highest demand (49.1%). Most dentists were female (60.6%) and were dental surgeons from the Family Health Strategy (61.3%). Most teleconsulting sessions occurred during working hours (85.5%) and questions were answered within 72 hours (66.7%). Level of satisfaction and avoidance of referral yielded rates of 90.9% and 66.8%, respectively, among dentists who answered about these topics. Semiology was the most frequently demanded area in teleconsulting (33.9%). The different demands from the regions reflected regional differences. The most frequently demanded specialties represent the Brazilian PHC scenario. Professionals incorporated teleconsulting into their work routine and most teleconsultants responded within the stipulated timeframe. Professional feedback should be encouraged.

Keywords: Telemedicine; Primary Health Care; Dentistry.

Introduction

Telehealth provides services and shares information on healthcare.[1] It has fosters the continuing education of health professionals and supports multidisciplinary care, especially in underserved areas.[2] Also, it has considerably improved quality, efficiency, and costs, expanding point-of-care options and diagnosis and decreasing inequalities in the provision of oral health services.[3]

Likewise, teledentistry facilitates remote dental care, via information technologies,[4] and has allowed earlier diagnosis than regular tests.[5] Teledentistry presents a wide range of applications, such as teleconsultations

(remote communication between dental professionals and patients), telediagnosis, teletriage, and telemonitoring, in which the progress of treatment outcomes and disease progression are monitored remotely.[6] Therefore, teledentistry has been used to improve people's access to specialized oral healthcare[5,7] and has been efficiently applied in teleassistance and tele-education in dental public health services.[7] In the current scenario of the COVID-19 pandemic, the importance of teledentistry has become even more noticeable, because it may reinforce social distancing, offering remote triage of patients for dental treatment, avoiding their unnecessary exposure.[8]

In Brazil, a developing country with continental dimensions, there is heterogeneous distribution of healthcare infrastructure, varying professional training levels, and socioeconomic and cultural contrasts, leading to unequal access to healthcare across its five regions.[9,10] Public dental care services are also included in this scenario, with differences in its geographical distribution and in the availability of dental supplies and equipment,[11] and the epidemiological aspects of the Brazilian population reflect the country's contrasts.[12]

The telehealth project was implemented in Brazil in 2006[3] by the Ministry of Health.[13] The program, currently known as the Telehealth Brazil Networks Program,[3] was expanded to include the entire country and was redefined to strengthen and increase the resolution ability of primary health care (PHC) services and improve access to specialized healthcare.[3,9]

One of the Program's strategies is teleconsulting, which consists of bidirectional communication between PHC professionals and teleconsultants (experts in a specific area) for assistance or advanced information on clinical care, health promotion actions, or work process. Teleconsulting is offered by telehealth centers and take place via synchronous messaging, videoconferences, or asynchronous messages that must be answered within 72 h.[3,7] Brazilian regulations state that teleconsulting must only occur between professionals rather than directly between patients and health professionals.[2] However, Resolution no. 226/2020 published in 2020, by the Brazilian Federal Council of Dentistry, allows telemonitoring (remote monitoring of patients undergoing treatment by dentists), and teleadvice with the application of a preclinical questionnaire to decide on the best time to attend to them, considering COVID-19 pandemic restrictions.[14]

The Program was has been evaluated by some studies,[15-17] but none has nationally explored dental teleconsulting. Thus, the present study aimed to nationally describe regional differences in dental teleconsulting provided by the Telehealth Brazil Networks Program.

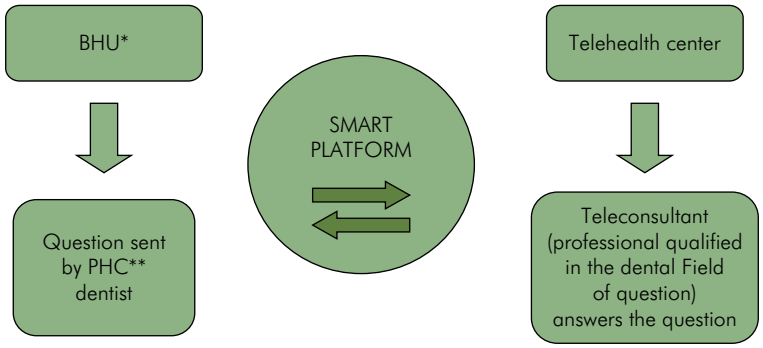
The null hypothesis was that Brazilian regions have a similar demand for teleconsulting.

Methodology

This cross-sectional and exploratory study evaluated a secondary database of asynchronous dental teleconsulting of the Telehealth Brazil Networks Program during 2019. Telehealth centers are deployed in almost every state of the country[18] but not all of them actively use telehealth services. The services provided by each center vary in terms of structure and capacity, and some centers book teleconsulting sessions with other telehealth centers. For example, the telehealth center platforms of the states of Rio Grande do Sul and Minas Gerais are also used for requests from other telehealth centers, thus helping meet the heavy demand. [19] The distribution of teleconsulting is shown in Figure.

Data were collected from the Monitoring and Evaluation System of the Telehealth Results (in Portuguese, Sistema de Monitoramento dos Resultados do Telessaúde — SMART) database, which integrates information on telehealth centers into the Program.[20]

In the SMART database, International Classification of Diseases (ICD-10) and the International Classification of Primary Care 2 (ICPC-2) codes applied to dentistry were used to filter asynchronous teleconsulting data.[21] As inclusion criteria, only teleconsulting requested by dentists was analyzed. Teleconsulting services extracted without any information about the state of origin (n=19) and duplicates were excluded (n=665). The theoretical model used considered that factors related to service, professionals, demand for healthcare, and socioeconomic issues may interfere in telehealth programs.[22] The following teleconsulting variables were used: dentist's sex and specialty and



*BHU: Basic health unit
** PHC: Primary health care

Figure. Flowchart of the order of teleconsulting distribution process.

date/time of question and answer, to determine whether teleconsulting was requested between 8 a.m. and 6 p.m. or outside working hours; response time in hours; professional satisfaction (satisfied, neither satisfied nor dissatisfied, or dissatisfied); and whether teleconsulting avoided patient referral (yes, no, or not informed). The fields of teleconsulting questions were categorized as per ICD-10 or ICPC-2 into clinical dentistry, which encompasses some dental specialties, such as dentistry, endodontics, and periodontics; health promotion and prevention (prophylactic measures and oral health education); pharmacology (prescription of medications and adverse effects); semiology (diagnosis in general and systemic disorders such as diabetes and hypertension); stomatology (oral lesions); and service (dental issues that do not fit into dental specialties, related to the health system, health service operation, administrative process, and patient referral). Five Brazilian regions were socioeconomically characterized according to the Human Development Index (HDI),[23] estimated population,[24] Gini coefficient,[25] and coverage of the dental specialty centers (DSCs),[26] oral health teams in Family Health Strategy (OHT/FHS), and OHT in PHC (OHT/PHC).[27]

The results were descriptively analyzed by frequency and stratified by Brazilian regions using the IBM Statistical Package for Social Sciences, v 22.0 (IBM SPSS Statistics for Windows, Armonk, NY, USA). For variables with missing data, the statistical analysis considered all valid information, and losses are explained in the tables.

The study was approved by the Research Ethics Committee of Universidade Federal de Minas Gerais (UFMG) under protocol Nº 3.662.611 (CAAE 17400319.9.0000.5149).

Results

A total of 2,703 teleconsulting sessions were conducted in Brazil in 2019, with the highest demand from the Southeast (49.1%), followed by the Midwest (23.5%). The South had the highest HDI and lowest Gini coefficient. The Southeast was the most populated region. DSC, OHT/FHS, and OHT/PHC coverages were better for the Northeast (Table 1).

Most dentists requesting teleconsulting were female (60.6%) and the most significant demand was for dental surgeons from the FHS (61.3%) and generalists (31.3%). Most teleconsulting sessions occurred during working hours (85.5%) and were answered within 72 hours (66.7%). Regarding professional satisfaction, 90.9% were satisfied (question answered by 53.3% of professionals). Concerning patient referral, 66.8% said teleconsulting avoided it (67.1% of professionals answered this question) (Table 2).

Regarding dental specialties, a large number of questions were related to semiology (33.9%), followed by clinical dentistry (31.6%) (Table 3).

Discussion

Different issues were addressed in teleconsulting across the five Brazilian regions, in line with their

Table 1. Socioeconomic analysis of the Brazilian regions concerning the demand for teleconsulting. Brazil, 2019.

Macro-region	North	Northeast	Midwest	Southeast	South
n (%)	11 (0.4)*	523 (19.3)*	636 (23.5)*	1,326 (49.1)*	207 (7.7)*
Total 2,703 (100.0%)					
HDI*	0.730	0.711	0.789	0.795	0.796
Gini coefficient*	0.542	0.543	0.499	0.521	0.465
Estimated Population	18,430,980	57,071,654	16,297,074	88,371,433	29,975,984
DSC/1,000,000 inhabitants (rate)	3.91	7.99	5.03	4.57	4.70
OHT/FHS**	41.19%	66.82%	47.83%	27.45%	36.50%
OHT/PHC**	49.51%	71.64%	56.19%	41.55%	50.42%

*Mean values considering the states of each macro-region; **Annual mean values; HDI: Human Development Index; DSC: dental specialty center; OHT: oral health team; FHS: family health strategy; PHC: primary healthcare.

Table 2. Descriptive analyses of the profile of dental teleconsulting by region. Brazil, 2019.

Region	North	Northeast	Midwest	Southeast	South	Total	Missing values
n (%)	11 (0.4)*	523 (19.3)*	636 (23.5)*	1,326 (49.1)*	207 (7.7)*		
Teleconsulting variables*							
Sex****							43 (1.6)
Female	6 (0.2)	276 (10.4)	432 (16.2)	761 (28.6)	137 (5.2)	1,612 (60.6)	
Dentist's specialty**							
Family Health Strategy	2 (0.1)	390 (14.4)	208 (7.7)	995 (36.8)	62 (2.3)	1,657 (61.3)	
General dental practicioner	6 (0.2)	116 (4.3)	370 (13.7)	270 (10.0)	84 (3.1)	846 (31.3)	
Specialist*	3 (0.1)	17 (0.6)	58 (2.2)	61 (2.3)	30 (1.1)	169 (6.3)	
Time of question							
Within working hours***	8 (0.3)	460 (17.0)	531 (19.7)	1,120 (41.4)	191 (7.1)	2,310 (85.5)	
Response time							
Up to 72 hours	9 (0.3)	454 (16.9)	338 (12.5)	881 (32.6)	120 (4.4)	1,802 (66.7)	
Satisfaction****							1,262 (46.7)
Satisfied	8 (0.6)	299 (15.9)	579 (40.2)	416 (28.9)	78 (5.4)	1,310 (90.9)	
Neither satisfied nor dissatisfied	0 (0.0)	13 (0.9)	11 (0.8)	13 (0.9)	2 (0.1)	39 (2.7)	
Dissatisfied	1 (0.1)	8 (0.6)	14 (1.0)	61 (4.2)	8 (0.6)	92 (6.4)	
Avoided referral****							888 (32.9)
Yes	6 (0.3)	242 (13.3)	572 (31.5)	276 (15.2)	117 (6.5)	1,213 (66.8)	

*Community Health (1.8), Periodontist (1.7%), Dentistry (1.3%), Endodontist (0.6%), Dentistry for Patients with Special Needs (0.3%); Implantodontist, Oral and Maxillofacial Traumatologist, Legal Dentist and Prosthodontist (0.1%); Orthopedist and Orthodontist, Pediatric Dentist, Stomatologist, Occupational Dentistry (0.0%); **Other: Auditor (1.1%); ***Between 8 am and 6 pm; ****Values corresponding to the total number of respondents.

socioeconomic and cultural contrasts, invalidating the null hypothesis.

The highest demand for teleconsulting from the Southeast was due to its larger population,[24] when compared to other regions, and to its higher percentage of telehealth centers, when compared to those in other states.[18] In addition, the Southeast has the second highest HDI of Brazil,[23] suggesting a better

Table 3. Descriptive analysis of dental teleconsulting by field of issue per region. Brazil, 2019.

Dental field n (%)	Region n (%)					Total
	North	Northeast	Midwest	Southeast	South	
	11 (0.4)*	523 (19.3)*	636 (23.5)*	1,326 (49.1)*	207 (7.7)*	
Semiology	2 (0.1)	55 (2.0)	104 (3.9)	735 (27.2)	19 (0.7)	915 (33.9)
Clinical dentistry	1 (0.0)	146 (5.4)	355 (13.1)	261 (9.7)	93 (3.4)	856 (31.6)
Stomatology	6 (0.2)	98 (3.6)	139 (5.1)	156 (5.8)	37 (1.4)	436 (16.1)
Health promotion and prevention	1 (0.0)	110 (4.1)	5 (0.2)	105 (3.9)	24 (0.9)	245 (9.1)
Services	1 (0.0)	56 (2.1)	32 (1.2)	57 (2.1)	30 (1.1)	176 (6.5)
Pharmacology	0 (0.0)	58 (2.1)	1 (0.0)	12 (0.5)	4 (0.1)	75 (2.8)

*Dental issues that did not fit into specialties, related to the health system, health service operation, administrative processes, and patient referral.

infrastructure of healthcare services, facilitating the communication between PHC professionals and teleconsultants.

The Midwest, with the third highest HDI,[23] the second lowest Gini coefficient,[25] and the second highest coverage of DSC,[26] OHT/FHS, and OHT/PHC[27] exhibited the second highest demand for teleconsulting.[27] Another possibility is that professionals from the Midwest are more aware of the use of the Program. Teleconsulting is a crucial tool for this region, not only for filtering secondary healthcare demand,[28] but especially for supporting PHC, given that the Midwest has one of the worst oral health indices.[12]

The Northeast had the third highest demand for teleconsulting. This ranking position might have resulted from its better PHC coverage[27], providing the population with better support. However, this region has the second most significant population, with the lowest socioeconomic status[23] and the highest amount of social inequalities.[25] Moreover, despite the better DSC coverage[26], Northeasterners have limited access of OHTs to DSC[28] and one of the greatest needs for restorations, endodontic treatments, and tooth extractions.[12] Accordingly, teleconsulting could help solve PHC problems, as patients at health units where the referral of more complex cases is difficult have to be assisted in the PHC setting.

The South had the best socioeconomic indices and the second lowest demand for teleconsulting. This might be due to the better oral health epidemiological characteristics of its population and the greater demand by teenagers, adults, and seniors for preventive oral health consultations.[12] This could result in fewer complex treatments (*e.g.*, restorations, endodontic treatments, and surgeries).[12] Thus, if the population requires less complex procedures and diagnosis, PHC dentists will probably have fewer concerns.

The North had the lowest demand for teleconsulting, with huge socioeconomic challenges just as the Northeast.[28] The population from the northern states, just as that of the Northeast and Midwest, have worse oral health status and require more complex treatments.[12] Also, the North has the lowest DSC coverage,[26] suggesting a lack of support for secondary healthcare. Teleconsulting could provide this support by assisting in the decision to treat patients in the PHC setting or refer them to other services.[14,20] Telehealth is likely to be underused in this region and should be stimulated to improve the healthcare of the population.

Eliminating regional differences in access to dental care is a daunting challenge. Integrated care is considered to provide higher-quality and more cost-effective care[28,29] and is often related to characteristics embraced by telehealth such as integrated ICTs, population-focused care, professional development, and innovation.[28] The importance of telehealth has also been reported for rural America, where increased provision of high-quality telehealth services may minimize disparities and enhance the connection between clinicians.[30]

The primary demand for teleconsulting in all Brazilian regions was from female dentists, as observed elsewhere,[15,16,31] and that may reflect the higher prevalence of females in healthcare services,[15,17] their greater adherence to the Program, or a more significant concern with women's professional conduct.[16] The primary demand from FHS dental surgeons and general dental practitioners was expected thanks to the Brazilian PHC profile.

According to the SMART, teleconsulting is the second most offered service by telehealth centers, and asynchronous activities are used mainly by PHC professionals,[19] probably because of the convenient time schedule.[15] While most teleconsulting sessions took place during working hours (South: 92.3%, Northeast: 88.0%, Southeast: 84.5%, Midwest: 83.4%, and North: 72.7%), 14.8% were requested after hours. As observed earlier,[16,32] some questions were submitted at night, suggesting professionals incorporated asynchronous teleconsulting into their routines.[32] However, this raises some concern because, outside working hours, professionals have other obligations to attend to and may forget or not have enough time for teleconsulting, and, therefore, their needs are eventually underreported. Evening requests may have occurred due to connectivity failures or difficulty accessing the platform during working hours because of work overload.[15]

Another possible reason may be that some managers do not allow access to the platform during working hours for streamlining professional production. Services should facilitate health professionals' access to the telehealth platform as a work routine,[15] and the government should improve the training of telehealth professionals to achieve more efficient PHC.

Most teleconsulting questions were answered within 72 h, showing telehealth centers reply within the stipulated time.[3] However, 33.2% of the requests were answered after 72 h, raising a concern, since it may compromise patient's assistance. In the Northeast and North, telehealth centers answered the questions within the stipulated time (86.8% and 81.8%, respectively), while in the Midwest, this rate was lower (53.1%). It is important to enhance the commitment of teleconsultants on providing PHC professionals with feedback.

Although most professionals answered the question about their satisfaction with the service, 46.7% did not, which limited the study and hindered the evaluation process.[17] This low response rate occurred in the Southeast, South, and Northeast regions (36.9% and 42.5%). The Midwest and North presented higher response rates (95.0% and 81.8%, respectively). Among the professionals who answered that question, almost all reported being very satisfied or satisfied. Satisfaction with the teleconsulting service has also been reported in previous studies[16,17,31] and points to the importance of telehealth in assisting PHC professionals. The ability of teleconsulting to help solve daily problems is related to greater utilization of the system[31], thus underscoring the importance of feedback from professionals [16,17] to render the program more effective.[33]

Regarding patient referral to other care levels, the response rate was a little higher, and 66.8% of the professionals who answered that question said teleconsulting avoided patient referral. The South and Southeast exhibited, once again, the lowest response rates (66.7% and 49.1%, respectively). The highest response rates were obtained from the Midwest and South (98.3% and 84.8%, respectively), whereas the Southeast had the highest rate (57.6%) relative to not avoiding patient referral. Various studies have suggested the efficacy of telehealth in avoiding unnecessary patient referral to secondary and tertiary care[15-17,31,32] and in increasing PHC effectiveness.[17] Telehealth can be used as a supporting tool for the referral and counterreferral systems, integrating them. Again, feedback from professionals is fundamental for the evaluation of the Program in the PHC setting.[16] The perception of the usefulness of telehealth is related to the fulfillment of users' needs, being extremely important for program planning and for incorporation of teleconsulting into daily practice.[31]

The higher demand for semiology (Southeast: 55.4%) and clinical dentistry (Midwest: 55.8%, South: 44.9%, and Northeast: 27.9%) issues was expected since they are constantly present in PHC. The highest demand for issues related to semiology indicated some

difficulty of professionals in diagnosing and managing patients with systemic disorders. Endodontics, minor oral surgery, and periodontics are constantly present in the daily practice of Brazilian PHC and are an integral part of clinical dentistry. They are the most common specialties that require referral to DSCs.[28] In this context, the support provided by teleconsulting may reduce unnecessary referrals and shorten the waiting time for secondary care.[28] Also, teledentistry could improve dental care through diagnostic collaboration between dental professionals.[5] In the northern region, stomatology issues accounted for the highest demand (55.0%). This higher demand for stomatology issues has also been observed in other studies[16-17] and may reveal the difficulty of PHC professionals in identifying and diagnosing oral lesions.

Accessing telehealth services is associated with better-quality health care[34] and could increase the problem-solving capacity of the OHT.[29] Nevertheless, a low rate of utilization of teledentistry services has been observed.[17] Factors such as service infrastructure, difficult access to computers, and internet speed and connection,[19,35,36] experience in the use of technology,[35] and high turnover of PHC professionals[20] can influence the adherence to the Program.

Data from the SMART secondary databases were a limitation of this study, as the information depends on the PHC professionals and telehealth centers. SMART is still underused by many telehealth centers, hindering the evaluation of the Program's impact in Brazil.[19] Integrating information systems[19] and encouraging professionals are challenges to be overcome.

Conclusions

Regions had different demands because of regional differences. The specialties that most demanded teleconsulting reflect the Brazilian PHC profile. Professionals incorporated teleconsulting into their work routine and most teleconsultants responded within the stipulated time. Feedback from professionals should be encouraged. The professionals' input and SMART use could help understand the impact of teleconsulting on the PHC support system.

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