





# Structural characteristics of oral health services in Brazilian Primary Health Care

**Maria Tereza Abreu SCALZO<sup>(a)</sup>**   
**Antônio Thomaz Gonzaga MATTACHADO<sup>(b)</sup>**   
**Mauro Henrique Nogueira Guimarães ABREU<sup>(c)</sup>**   
**Renata Castro MARTINS<sup>(c)</sup>** 

<sup>(a)</sup>Universidade Federal de Minas Gerais - UFMG, School of Dentistry, Postgraduate Program in Dentistry, Belo Horizonte, MG, Brazil.

<sup>(b)</sup>Universidade Federal de Minas Gerais - UFMG, School of Medicine, Department of Preventive and Social Medicine, Belo Horizonte, MG, Brazil.

<sup>(c)</sup>Universidade Federal de Minas Gerais - UFMG, School of Dentistry, Department of Community and Preventive Dentistry, Belo Horizonte, MG, Brazil.

**Declaration of Interests:** The authors certify that they have no commercial or associative interest that represents a conflict of interest in connection with the manuscript.

**Corresponding Author:**

Renata Castro Martins  
E-mail: r.c.martins@uol.com.br

<https://doi.org/10.1590/1807-3107bor-2021.vol35.0023>

Submitted: May 21, 2020  
Accepted for publication: October 6, 2020  
Last revision: November 9, 2020

**Abstract:** This study aimed to describe the structure of oral health services in primary health care in Brazil with centers participating in the second cycle of the 'National Program for Improving Access and Quality of Primary Care' (PMAQ-AB), the largest health service evaluation program ever instituted in the country. This cross-sectional study evaluated 16,202 oral health services, regarding 22 pieces of dental equipment and 25 dental supplies. The presence of each piece of equipment/dental supply generated a score for services. The sum of these scores was compared among different regions in Brazil. Quantitative data were described by quartiles and categorical data by frequencies, using the SPSS, version 25. Most of the evaluated centers presented adequate equipment in good using conditions and sufficient dental supplies for primary oral health care. Data also showed a lack of some equipment, such as X-rays, bicarbonate jet, and ultrasound devices, while for dental supplies, a lack of amalgam (capsule and manual preparation), anesthesia without vasoconstrictors, and intracanal medication was found. The services presented a median of 14 pieces of equipment and 22 dental supplies. Of the Brazilian regions, the South presented the highest median, while the North and Northeast regions presented the lowest one. The oral health services presented dental offices with good availability of equipment and dental supplies to perform clinical activities. However, differences in the structure of services among the Brazilian regions was still observed.

**Keywords:** Primary Health Care; Health Services Research; Dental Health Services.

## Introduction

The inclusion of Oral Health Teams (OHT) in the Family Health Strategy was the starting point for the application of the principles of Primary Health Care (PHC) in the Brazilian oral health care. The National Oral Health Policy, implemented in 2004, provided the expansion and qualification of Oral Health Services (OHS), increasing the resolution of dental care actions in the PHC.<sup>1</sup>

The evaluation of health services is desirable to analyze the quality of care, detect and correct faults, and provide information in order to enhance the decision-making process in relation to health practices and



policies, favoring the expansion and equitable access to health services.<sup>2</sup>

Based on the strategy “evaluate to improve the quality of health services”, one of the measures implemented by the Brazilian Ministry of Health was the National Program for Improving Access and Quality of Primary Care (*Programa Nacional de Melhoria do Acesso e da Qualidade da Atenção Básica - PMAQ-AB* in Portuguese).<sup>3</sup> PMAQ-AB is the largest health service evaluation program ever instituted in the country.

The PMAQ-AB is organized in four phases (adherence and contractualization, development, external evaluation, and recontractualization), forming continuous cycles of evaluation, which seek to overcome some challenges for PHC qualification, such as the precariousness of the physical structure and the unsatisfactory conditions of Basic Health Units.<sup>3</sup>

Evaluations using data from the 1st and 2nd cycle of PMAQ-AB have already addressed the work process of the teams,<sup>4</sup> user satisfaction with services rendered,<sup>5</sup> service provisions and basic care procedures,<sup>6,7</sup> and availability of instruments in OHS.<sup>8</sup>

The provision of effective healthcare services is directly influenced by infrastructure conditions, and availability and adequacy of equipment, as well as materials and supplies that meet the needs of the service. Problems in this area compromise care, the quality of the services rendered, and the achievement of goals, making it impossible to perform clinical procedures effectively.<sup>9</sup>

Data from the 1st and 2nd cycle of the PMAQ-AB showed failure of OHTs to perform more complex procedures in PHC, such as the manufacture of dental prosthesis, as recommended by the Brazilian oral health policy.<sup>6,7</sup> This may have occurred due to a lack of structural support.<sup>7</sup>

The structure of the health service is considered an important component for the analysis of a health system. Although a good structure does not necessarily lead to good processes and results, its importance for healthcare outcomes cannot be ignored.<sup>8</sup>

Although Lopes et al.<sup>8</sup> evaluated the availability of dental instruments in OHS, that nation-based study fails to describe the structural characteristics

regarding the availability of dental equipment and essential supplies for dental practice in Brazilian PHC. Thus, the aim of this study was to describe the structure of Brazilian OHS that participated in the second cycle of the PMAQ-AB, in relation to the presence of essential dental equipment and supplies for dental practices, comparing this structure among Brazilian macro-regions.

## Methodology

This study was approved by the Research Ethics Committee of the Universidade Federal de Minas Gerais (CAAE - 02396512.8.0000.5149).

This cross-sectional, quantitative study used secondary data from the second cycle of the PMAQ-AB external evaluation from 2013 to 2014. For this study, information on the access conditions and quality of the participating OHT program were collected.

In December 2014, Brazil had a total of 24,279 OHTs,<sup>10</sup> of which 19,946 (82.0%) participated in the second cycle of PMAQ-AB. However, 2,433 were not included in this evaluation, since they did not fit the requirements of the program, such as an appropriate oral health surveillance system, the presence of a dentist in the unit, and appropriate dental equipment. Some PHC units included more than one OHT. Therefore, 16,202 PHC services were evaluated, corresponding to 17,513 OHTs (72.0% of the total).

The external evaluation of PMAQ-AB consisted of data collection through an evaluation tool developed by the Brazilian Ministry of Health, in partnership with 46 Brazilian teaching and research institutions, containing established quality standards according to norms, protocols, principles, and guidelines for the organization of actions and practices, the collection of technical and scientific knowledge, and the competencies of the professionals involved.

Data collection was done with tablets, using a specific program for PMAQ-AB organized in three modules. Data were obtained through Module I - Observation in the Basic Health Units. The program contained photos and descriptions of the dental equipment and supplies, criteria for assessing the

presence and minimum quantity of materials for each health unit's operations according to parameters established by the Ministry of Health. After data collection, the partner institutions performed the data validation and sent the results to the Ministry of Health central database.

The questions evaluated in this study were predominantly dichotomous and evaluated the presence and quantity of 22 pieces of dental equipment and 25 dental supplies routinely used by the OHTs in the healthcare services. The presence of each piece of dental equipment/supply attributed a score to each Basic Health Unit, with the final score being the sum of the quantity of dental equipment and supplies identified at the health service (from 0 to 22 points for equipment and from 0 to 25 for supplies). For example, if a service score was 18 for equipment, it meant that this service presented 18 of the 22 surveyed pieces of dental equipment at the clinic. The same occurred for supplies. After this, health services were divided by Brazilian macro-regions, and the score for equipment and supplies for each macro-region was calculated.

The results were analyzed descriptively, using the Statistical Package for Social Sciences (SPSS), v. 25.0 (IBM SPSS Statistics for Windows, Armonk, USA). Quantitative data were analyzed by the Kolmogorov-Smirnov test. Since they did not present a normal distribution ( $p < 0.001$ ), they were described by medians and quartiles, and the categorical data were described by frequency.

## Results

Table 1 shows the frequency of the dental equipment present in the evaluated OHS. Almost all services had a dental chair (99.0%), cuspidor (98.2%), aspiration (98.1%), operator light (98.7%), dental stool (98.4%), high-speed air-driven handpiece (98.8%), low-speed air-driven handpiece (92.7%), and air compressor (96.9%). When asked about the equipment's condition of use, above 90% of the dental services had at least one functioning piece of equipment. A deficiency of essential equipment to perform prophylaxis, such as ultrasonic scalers (30.4%) and bicarbonate air polishers (31.1%), was observed, in addition to the

lack of ancillary equipment for diagnosis, represented by a dental X-ray machine, present in 25.6% of the evaluated services, as well as equipment for the sterilization of materials, such as an autoclave (76.2%) and dry heat sterilizers (22.5%).

Table 2 shows the distribution of the health services of the OHTs, evaluated according to the scores of the calculated equipment and the scores calculated by macro-region. The OHT presented a median of 14 (Q25 = 13, Q75 = 16) pieces of equipment per health unit. When analyzing these data by macro-region, it was observed that the South region had the highest median, with 16 pieces of dental equipment per health unit, followed by the Southeast and Midwest regions, with a median of 15.

Table 3 shows the frequency of dental supplies present in the OHS analyzed in this study. Nearly all of the OHS had acids and adhesives for dental composite resins fillings (96.7%), anesthesia with vasoconstrictors (96.3%), various burs (98.1%), personal protective equipment (97.8%), light-curing resins (97.5%), and temporary restorative material (96.5%). On the other hand, there was a deficiency of some important dental supplies, such as amalgam in capsules (67.0%), amalgam for manual preparation (25.9%), anesthesia without vasoconstrictors (77.2%), intracanal medications for live pulp and necrosis (73.6%), sealants (70.1%), and disposable syringes for irrigation (75.8%). When asked if the quantities were sufficient, more than 94% responded positively.

Table 4 shows the distribution of OHS according to the Brazilian macro-region and the scores of supplies calculated and verified per macro-region. The total median of OHSs was 22 inputs (Q25 = 20, Q75 = 23). When analyzing these data by macro-region, it was observed that the South region had the highest median with 23 inputs per health unit, followed by the Southeast and Midwest regions with a median of 22.

## Discussion

Descriptive analyzes showed that most of the evaluated OHS had dental equipment that met the proper conditions of use and a sufficient quantity of

**Table 1.** Descriptive analysis of present dental equipment that met proper use conditions in the oral health services evaluated in this study. PMAQ-AB. Brazil, 2013-2014 (n = 16,202).

Present equipment (n = 16,602)	Frequencies	
	n	%
Dental Amalgamator	14,328	88.4
At least one in usable condition	13,731	98.4
Did not know / Did not respond on the condition of use	374	2.3
Dental X-ray Machine	4,154	25.6
At least one in usable condition	3,645	90.1
Did not know / Did not respond on the condition of use	110	2.6
Air Conditioner	11,396	70.3
At least one in usable condition	10,84	97.6
Did not know / Did not respond on the condition of use	295	1.8
Autoclave	12,354	76.2
At least one in usable condition	11,74	97.6
Did not know / Did not respond on the condition of use	328	2.0
Lead Apron	3,256	20.1
At least one in usable condition	3,121	98.7
Did not know / Did not respond on the condition of use	94	0.6
Dental Chair	16,045	99.0
At least one in usable condition	15,441	98.8
Did not know / Did not respond on the condition of use	415	2.6
With proper padding	14,702	94.1
Did not know / Did not about padding	415	2.6
Performing a "up", "down", and "recline" movement appropriately	15,105	96.6
Did not know / Did not respond about movements	415	2.6
Cuspidor	15,907	98.2
At least one in usable condition	15,269	98.5
Did not know / Did not respond on the condition of use	404	2.5
Aspiration unit	15,897	98.1
At least one in usable condition	15,14	97.8
Did not know / Did not respond on the condition of use	414	2.6
Operatory Light	15,996	98.7
At least one in usable condition	15,376	98.7
Did not know / Did not respond on the condition of use	413	2.5
Dental Stool	15,945	98.4
At least one in usable condition	15,424	99.3
Did not know / Did not respond on the condition of use	412	2.5
Dental Cart	15,621	96.4
At least one in usable condition	15,101	99.2
Did not know / Did not respond on the condition of use	393	2.5
High-speed air-driven handpiece	15,873	98.0

Continue...

... Continuation

At least one in usable condition	15,255	98.7
Did not know / Did not respond on the condition of use	415	2.6
Low-speed air-driven handpiece	15,015	92.7
At least one in usable condition	14,306	97.8
Did not know / Did not respond on the condition of use	391	2.4
Air compressor with safety valve	15,702	96.9
At least one in usable condition	15,067	98.4
Did not know / Did not respond on the condition of use	397	2.5
Dental curing lights	15,628	96.5
At least one in usable condition	15,035	98.8
Did not know / Did not respond on the condition of use	410	2.5
Bicarbonate air polisher	5,044	31.1
At least one in usable condition	4,581	93.8
Did not know / Did not respond on the condition of use	158	1.0
Macro Dental arcade model and macro dental brush	10,316	63.7
At least one in usable condition	9,946	99.3
Did not know / Did not respond on the condition of use	298	1.8
Ultrasonic scaler	4,93	30.4
At least one in usable condition	4,531	95.5
Did not know / Did not respond on the condition of use	187	1.2
Revelation box (Darkroom)	3,8	23.5
At least one in usable condition	3,617	97.9
Did not know / Did not respond on the condition of use	106	0.7
Dry heat sterilizer	3,643	22.5
At least one in usable condition	3,344	94.6
Did not know / Did not respond on the condition of use	107	0.7
X-ray viewer	3,159	19.5
At least one in usable condition	2,969	97.7
Did not know / Did not respond on the condition of use	119	0.7
Heat sealer	4,914	30.3
At least one in usable condition	4,636	97.5
Did not know / Did not respond on the condition of use	157	1.0

**Table 2.** Descriptive analysis of oral health services evaluated per macro-region and relevant scores for dental equipment. PMAQ-AB. Brazil. 2013-2014 (n = 16,202).

Brazilian macro-regions	Oral health services		Score		
	Absolute frequency (n)	Relative frequency (%)	Q25	Median	Q75
North	1,097	6.8	13	14	16
Northeast	7,199	44.4	13	14	15
Midwest	1,389	8.6	13	15	17
Southeast	4,256	26.3	13	15	17
South	2,261	14.0	14	16	18

**Table 3.** Descriptive analysis of dental supplies present in the oral health services evaluated in this study. PMAQ-AB, Brazil, 2013-2014 (n = 16,202).

Dental Supplies at the health service	Frequencies	
	n	%
Acid and adhesive for dental composite resins	15,663	96.7
In sufficient quantity	15,151	96.7
Dental cotton roll	15,747	97.2
In sufficient quantity	15,472	98.3
Amalgam (capsule)	10,853	67.0
In sufficient quantity	10,589	97.6
Amalgam (manual preparation)	4,195	25.9
In sufficient quantity	4,063	96.9
Topical anesthetic	15,185	93.7
In sufficient quantity	14,742	97.1
Anesthesia with vasoconstrictors	15,604	96.3
In sufficient quantity	15,265	97.8
Anesthesia without vasoconstrictors	12,513	77.2
In sufficient quantity	12,168	97.2
Scalpel blade	14,865	91.7
In sufficient quantity	14,491	97.5
Various burs	15,897	98.1
In sufficient quantity	14,941	94.0
Various cements	14,898	92.0
In sufficient quantity	14,234	95.5
Dental wedge	13,342	82.3
In sufficient quantity	13,12	98.3
Personal protective equipment – gloves, glasses, masks, coat, disposable caps	15,838	97.8
In sufficient quantity	14,901	94.1
Dental sutures	15,758	97.3
In sufficient quantity	15,409	97.8
Fluoride gel	15,293	94.4
In sufficient quantity	14,861	97.2
Fixer and developer for radiography	3,63	22.4
In sufficient quantity	3,524	97.1
Dental gauze	15,875	98.0
In sufficient quantity	15,549	97.9
Temporary restorative material	15,63	96.5
In sufficient quantity	15,237	97.5
Dental matrix band	15,693	96.9
In sufficient quantity	15,39	98.1
Intracanal medications for live pulp and necrosis	11,923	73.6
In sufficient quantity	11,217	94.1
Microbrush	15,079	93.1

Continue...

... Continuation

In sufficient quantity	14,816	98.3
Dental articulating paper (carbon paper)	14,733	90.9
In sufficient quantity	14,399	97.7
Sharp disposal containers	15,009	92.6
In sufficient quantity	14,704	98.0
Light-curing resins	15,805	97.5
In sufficient quantity	15,274	96.6
Sealant	11,361	70.1
In sufficient quantity	11,003	96.8
Disposable syringes for irrigation	12,281	75.8
In sufficient quantity	12,003	97.7

**Table 4.** Descriptive analysis of oral health services of the OHT evaluated by macro-region and relevant scores for inputs. PMAQ-AB. Brazil, 2013-2014 (n = 16,202).

Brazilian macro-regions	Oral health services		Score		
	Absolute frequency (n)	Relative frequency (%)	Q25	Median	Q75
North	1,097	6.8	19	21	22
Northeast	7,199	44.4	19	21	22
Midwest	1,389	8.6	21	22	23
Southeast	4,256	26.3	21	22	23
South	2,261	14.0	22	23	23

supplies recommended for primary care in oral health, but regional inequalities were identified based on the scores of dental equipment and supplies among the Brazilian macro-regions.

A deficiency was observed in the availability and operating conditions of some essential dental equipment. In most of the services, only one piece of equipment was in usable condition to perform dental care, such as autoclaves, dental chairs, high-speed pens, and X-ray devices. In addition, a deficiency was found in the availability of some dental supplies, such as amalgam in capsules and for manual preparation, anesthesia without vasoconstrictors, and intracanal medication for live and necrotic pulp.

Most OHS are well-structured, but some must be improved so as to avoid failure in dental care due to lack of infrastructure. Infrastructure, as well as the presence and regular maintenance of dental supplies, are important for the proper operation of health services,<sup>11</sup> given that the lack or insufficiency of such

conditions has a direct impact on the effectiveness of dental care.

Dental X-ray machines were rarely found in the OHS evaluated in this study. This finding can be explained by the Brazilian Ministry of Health parameter of one dental X-ray machine for every 25,000 inhabitants.<sup>12</sup> Dental X-ray exams are complementary and do not substitute the complete clinical examination, but when available, they can serve as a subsidiary resource for patient diagnoses, prognoses, therapeutic planning, and preservation.<sup>13</sup>

The low availability of autoclaves can be explained by the sterilization process of dental instruments occurring outside the health service in some municipalities, in a centralized sterilization facility.<sup>14</sup> However, there are advantages in the availability of this equipment in health services, such as increased efficiency and reduced costs. Steam sterilization, using autoclaves, is the most commonly used method recommended for the



disinfection of critical instruments to prevent and control cross-infection in dentistry<sup>15</sup>. Due to this recommendation, the low amount of dry heat sterilizers available in the evaluated services (22.5%) is justified, since dry heat is recommended only for oils and powders in the medical field and for some types of burs and orthodontic pliers in dentistry.<sup>16</sup>

Although the frequency of personal protective equipment was high, the percentage of centers having sufficient quantities was lower. This raises concern, especially considering the current coronavirus disease pandemic (COVID-19)<sup>17,18,19</sup>. Dental care involves close contact of the professional with the patient's oral and nasal cavities. Due to the nature of dental procedures and the large amount of droplets and aerosols which could be produced, personal protective equipment is essential and should be available in sufficient quantity to health professionals.<sup>17,18</sup>

The low availability of amalgam in capsules and for manual preparation can be explained by the substitution of this material by composite resin due to the increasing demand for esthetic restorations, the use of the mercury in its alloy, and the need for greater tooth wear during preparation.<sup>20</sup> Amalgam is still the worldwide material of choice for restorations in posterior teeth with interproximal caries<sup>21</sup> as it has a lower cost<sup>19</sup> and greater clinical longevity when compared to composite resins,<sup>20</sup> justifying its use when we consider effectiveness, efficiency and cost, especially in public health.

The low availability of anesthesia without vasoconstrictors can cause problems for the service, since this is the anesthesia of choice for cardiac patients, given that the use of anesthesia with vasoconstrictors in these patients can lead to hypertension, arrhythmias, and infarction. In addition, interactions may occur between drugs used to control hypertension and vasoconstrictors, causing hypertensive crises or orthostatic hypotension.<sup>22</sup>

Dental pain is considered a public health problem and one of the main reasons that lead patients to seek dental care.<sup>23</sup> In urgent care, the correct access to pulp and the use of intracanal medication are fundamental steps for the management of endodontic pain. These medications help reduce the

bacterial population of the root canal system and its by-products, thus contributing to reduce pain.<sup>24</sup> After COVID-19 pandemic, several guidelines for dental practice have been published.<sup>17,25,26</sup> These guidelines have recommended the suspension of elective dental treatment maintaining only emergency dental appointments. The deficiency of supplies for urgent care may result in a non-resolving treatment, leading patients to recurrent pain and urgent returns to PHCs before beginning specialized treatment. The mean waiting time for specialized endodontic treatment after PHC referral ranges from 1 month<sup>27</sup> to 5 months.<sup>28</sup> This time lapse can cause recurrent urgent treatments for pain relief, overloading PHCs. With social distancing measures and dental professionals performing only urgency treatments,<sup>17,25,26</sup> the adequate supply of materials to solve urgent cases is essential.

The analysis by Brazilian macro-regions revealed the heterogeneity in the availability of equipment and dental supplies. The South region presented the best equipment and input scores, followed by the Midwest and Southeast regions, which matched the equipment and supplies scores. The differences found can be explained by the type of health services' organization, which can be influenced by socioeconomic needs and the demographic conditions of each region. Brazil is a developing country with great territorial extension and high levels of socioeconomic inequality, which may explain different types of service management within its macro regions. The Brazilian economy is concentrated in the Southeast and South regions of the country, which consequently have better incentives for public health.<sup>29</sup> The North and Northeast regions are recognized as the least developed in Brazil, with difficulties mainly in infrastructure and basic sanitation,<sup>30</sup> which was reflected in the present study's findings, with lower equipment and supplies scores. As of 2004,<sup>1</sup> there was an increase in financial incentives for oral health in municipalities with a lower Human Development Index. However, the impact of public policies and organization of OHS may be related to human development in these two regions.

Another study, using data from the 1st cycle of PMAQ-AB, also found regional differences between



primary and secondary care, with better results for the South and Southeast regions.<sup>27</sup> These differences between macro-regions have also been demonstrated in basic care procedures performed using the PMAQ-AB with participating OHTs,<sup>6</sup> reinforcing the idea that health inequalities in Brazil have a regional character, partly due to differences in the social determinants of health among regions, which are mirrored in the quality of the health care services.

Regarding the Midwest region, the good score presented in this study may reflect the increase in the number of OHTs. In 2004, this macro-region had 839 teams, jumping to 1,973 in 2014, an increase of 135%. There was also an increase in fund transfers per region in 2012 and 2013.<sup>10</sup>

One limitation of the present study is the use of secondary data, which can lead to errors arising from the methodology of data collection and processing before being made available to researchers. In addition, PMAQ-AB transfers a monetary incentive based on performance of the participating teams.

As external evaluation is limited to the presentation of the equipment or input in the service, but their long-term maintenance for effective use in dental care is not assessed. This can lead to the reporting of equipment/inputs that are not available in the

day-to-day service to guarantee a good performance rating. Comparisons with other studies are difficult, since the nation-based studies on this subject are still scarce.

Effective oral health care is not dependent only to the service structures, but this aspect is relevant and should be considered. The availability of equipment and supplies in OHS can directly impact the quality of service offered to the population, which may lead to an increased waiting time for dental care and even aggravate the repressed demand for primary oral health care in Brazil.

The OHS evaluated in this study, for the most part, had enough dental equipment and supplies to carry out clinical activities. However, efforts are still needed to scale up and qualify services in terms of infrastructure, especially when considering regional inequalities.

## Acknowledgements

This study was supported by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), and Pró-Reitoria de Pesquisa da Universidade Federal de Minas Gerais (PRPq-UFMG).

## References

1. Pucca GA Jr, Costa JF, Chagas LD, Sivestre RM. Oral health policies in Brazil. *Braz Oral Res.* 2009;23 Suppl 1:9-16. <https://doi.org/10.1590/S1806-83242009000500003>
2. Miclos PV, Calvo MC, Colussi CF. Evaluation of the performance of actions and outcomes in primary health care. *Rev Saude Publica.* 2017;51:86. <https://doi.org/10.11606/s1518-8787.2017051006831>
3. Ministry of Health (BR). National Program for Improving Access and Quality of Primary Care: Instructional manual. Brasília, DF: Ministry of Health; 2012 [cited 2018 Oct 18]. Available from [http://bvsm.s.saude.gov.br/bvs/publicacoes/manual\\_instrutivo\\_pmaq\\_atencao\\_basica.pdf](http://bvsm.s.saude.gov.br/bvs/publicacoes/manual_instrutivo_pmaq_atencao_basica.pdf)
4. Fagundes DM, Thomaz EB, Queiroz RC, Rocha TA, Silva NC, Vissoci JR, et al. [Dialogues on the work process in oral health in Brazil: an analysis based on the PMAQ-AB survey]. *Cad Saude Publica.* 2018 Sep;34(9):e00049817. Portuguese. <https://doi.org/10.1590/0102-311x00049817>
5. Protasio AP, Gomes LB, Machado LD, Valença AM. User satisfaction with primary health care by region in Brazil: 1st cycle of external evaluation from PMAQ-AB. *Cien Saude Colet.* 2017 Jun;22(6):1829-44. <https://doi.org/10.1590/1413-81232017226.26472015>
6. Reis CM, Matta-Machado AT, Amaral JH, Werneck MA, Abreu MH. Describing the primary care actions of oral health teams in Brazil. *Int J Environ Res Public Health.* 2015 Jan;12(1):667-78. <https://doi.org/10.3390/ijerph120100667>
7. Mendes SR, Martins RC, Matta-Machado AT, Mattos GC, Gallagher JE, Abreu MH. Dental procedures in primary health care of the Brazilian National Health System. *Int J Environ Res Public Health.* 2017 Dec;14(12):1480. <https://doi.org/10.3390/ijerph14121480>
8. Lopes J, Palmier AC, Werneck MA, Matta-Machado AT, Abreu MH. A Survey about dental instruments at the primary health care in Brazil. *Braz Dent J.* 2018 Sep-Oct;29(5):500-6. <https://doi.org/10.1590/0103-6440201801969>
9. Baumgarten A, Hugo FN, Bulgarelli AF, Hilgert JB. Curative procedures of oral health and structural characteristics of primary dental care. *Rev Saude Publica.* 2018 Apr;52:35. <https://doi.org/10.11606/S1518-8787.2018052016291>

10. Ministry of Health (BR). Strategic Management Support Room – SAGE. [homepage] [cited 2018 Dec 4]. Available from: <http://sage.saude.gov.br>
11. Ministry of Health (BR). Portaria nº 2.488, de 21 de outubro de 2011. Aprova a Política Nacional de Atenção Básica, estabelecendo a revisão de diretrizes e normas para a organização da Atenção Básica, para a Estratégia Saúde da Família (ESF) e o Programa de Agentes Comunitários de Saúde (PACS). 2011 [cited 2019 Apr 11]. Available from: [http://bvsms.saude.gov.br/bvs/saudelegis/gm/2011/prt2488\\_21\\_10\\_2011.html](http://bvsms.saude.gov.br/bvs/saudelegis/gm/2011/prt2488_21_10_2011.html)
12. Ministry of Health (BR). Portaria nº 1.101, de 12 de junho de 2002. Estabelece os parâmetros de cobertura assistencial no âmbito do Sistema único de Saúde – SUS.. [cited 2019 Nov 7]. Available from: [http://bvsms.saude.gov.br/bvs/saudelegis/gm/2002/prt1101\\_12\\_06\\_2002.html](http://bvsms.saude.gov.br/bvs/saudelegis/gm/2002/prt1101_12_06_2002.html)
13. American Dental Association Council on Scientific Affairs. The use of dental radiographs: update and recommendations. *J Am Dent Assoc.* 2006 Sep;137(9):1304-12. <https://doi.org/10.14219/jada.archive.2006.0393>
14. Abreu MH, Resende VL, Lee KH, Matta-Machado AT, Starr JR. Regional differences in infection control conditions in a sample of primary health care services in Brazil. *Cad Saude Publica.* 2017 Nov;33(11):e00072416. <https://doi.org/10.1590/0102-311x00072416>
15. Rani L. Sterilization protocols in dentistry: a review. *Int J Pharm Sci Res.* 2016;8:558-64.
16. Agência Nacional de Vigilância Sanitária – Anvisa. Serviços odontológicos: prevenção e controle de riscos. Brasília, DF: Agência Nacional de Vigilância Sanitária; 2006 [cited 2019 Apr 11]. Available from: [http://www.anvisa.gov.br/servicos/saude/manuais/manual\\_odonto.pdf](http://www.anvisa.gov.br/servicos/saude/manuais/manual_odonto.pdf)
17. Center for Disease Control and Prevention – CDC. Guidance for dental settings. Interim infection prevention and control guidance for dental settings during the COVID-19 response. 2020 [cited 2020 July 27]. Available from: <https://www.cdc.gov/coronavirus/2019-ncov/hcp/dental-settings.html>
18. Meng L, Hua F, Bian Z. Coronavirus disease 2019 (COVID-19): emerging and future challenges for dental and oral medicine. *J Dent Res.* 2020 May;99(5):481-7. <https://doi.org/10.1177/0022034520914246>
19. Mattos FF, Pordeus IA. COVID-19: a new turning point for dental practice. *Braz Oral Res.* 2020;34:e085. <https://doi.org/10.1590/1807-3107bor-2020.vol34.0085>
20. Moraschini V, Fai CK, Alto RM, Dos Santos GO. Amalgam and resin composite longevity of posterior restorations: a systematic review and meta-analysis. *J Dent.* 2015 Sep;43(9):1043-50. <https://doi.org/10.1016/j.jdent.2015.06.005>
21. Rasines Alcaraz MG, Veitz-Keenan A, Sahrman P, Schmidlin PR, Davis D, Iheozor-Ejiofor Z. Direct composite resin fillings versus amalgam fillings for permanent or adult posterior teeth. *Cochrane Database Syst Rev.* 2014 Mar;3(3):CD005620. <https://doi.org/10.1002/14651858.CD005620.pub2>
22. Southerland JH, Gill DG, Gangula PR, Halpern LR, Cardona CY, Mouton CP. Dental management in patients with hypertension: challenges and solutions. *Clin Cosmet Investig Dent.* 2016 Oct;8:111-20. <https://doi.org/10.2147/CCIDE.S99446>
23. Cavaleiro CH, Abegg C, Fontanive VN, Davoglio RS. Dental pain, use of dental services and oral health-related quality of life in southern Brazil. *Braz Oral Res.* 2016 Aug;30(1):e39. <https://doi.org/10.1590/1807-3107BOR-2016.vol30.0039>
24. Torabinejad M, Handysides R, Khademi AA, Bakland LK. Clinical implications of the smear layer in endodontics: a review. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2002 Dec;94(6):658-66. <https://doi.org/10.1067/moe.2002.128962>
25. American Dental Association – ADA . COVID-19 safety and clinical resources. Chicago: American Dental Association; 2020 [cited 2020 July 30]. Available from: <https://success.ada.org/en/practice-management/patients/safety-and-clinical>
26. Agência Nacional de Vigilância Sanitária – Anvisa.. Nota Técnica GVIMS/GGTES/ANVISA Nº 04/2020. Orientações para serviços de saúde: medidas de prevenção e controle que devem ser adotadas durante a assistência aos casos suspeitos ou confirmados de infecção pelo novo coronavírus (SARS-CoV-2). Brasília, DF: Anvisa; 2020 Mar 31 [cited 2020 July 30]. Available from: <http://portal.anvisa.gov.br/documents/33852/271858/Nota+T%C3%A9cnica+n+04-2020+GVIMS-GGTES-ANVISA/ab598660-3de4-4f14-8e6f-b9341c196b28>
27. Martins RC, Reis CM, Matta Machado AT, Amaral JH, Werneck MA, Abreu MH. Relationship between primary and secondary dental care in public health services in Brazil. *PLoS One.* 2016 Oct;11(10):e0164986. <https://doi.org/10.1371/journal.pone.0164986>
28. Magalhães MB, Oliveira DV, Lima RF, Ferreira EF, Martins RC. Evaluation of secondary care in endodontics at Dental Specialties Centers (DSC). *Cien Saude Colet.* 2018 May [cited 2019 Mar 20]. Available from <http://www.cienciaesaudecoletiva.com.br/en/articles/evaluation-of-secondary-care-in-endodontics-at-dental-specialties-centers-dsc/16782?id=16782>
29. Griesse MA. The geographic, political, and economic context for corporate social responsibility in Brazil. *J Bus Ethics.* 2007;73(1):21-37. <https://doi.org/10.1007/s10551-006-9194-2>
30. Paim J, Travassos C, Almeida C, Bahia L, Macinko J. The Brazilian health system: history, advances, and challenges. *Lancet.* 2011 May;377(9779):1778-97. [https://doi.org/10.1016/S0140-6736\(11\)60054-8](https://doi.org/10.1016/S0140-6736(11)60054-8)