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# TECHNOLOGICAL IMPROVEMENTS IN DENTAL CLINICS FOR THE BRAZILIAN UNIFIED HEALTH SYSTEM (SISTEMA ÚNICO DE SAÚDE – SUS): A LITERATURE REVIEW

**Rafaela Regina LIMA**
**Universidade Federal de Minas Gerais**
**E-mail: rafaelardlima@gmail.com**
**ORCID: http://orcid.org/0009-0000-6008-4347**

**Jader Oliva JORGE**
**Universidade Federal de Minas Gerais**
**E-mail: Jader.oj@gmail.com**
**ORCID: http://orcid.org/0000-0002-0294-895X**

**Kelly Oliva JORGE**
**Pontifícia Universidade Católica de Minas Gerais**
**E-mail: Kellyoliva@yahoo.com.br**
**ORCID: http://orcid.org/0000-0001-6829-6029**



## ABSTRACT

The guidelines of the National Oral Health Policy (Política Nacional de Saúde Bucal – PNSB), established in 2004, aimed to provide support to oral health teams integrated with Family Health Strategy (Estratégia Saúde da Família – ESF) teams, offer continuous training for health professionals, promote and fund research addressing the challenges in health promotion, and foster improvements in products and technologies used in public care. This study aimed to discuss the importance of acquiring and renewing dental technologies within the Brazilian Unified Health System (Sistema Único de Saúde – SUS). A literature review was conducted through an active search of manuscripts on the BIREME, LILACS and Google Scholar databases, without restrictions regarding publication period or language. It was found that although the Brazilian Ministry of Health provides equipment, supplies and materials for dental care, the available resources are insufficient to meet the population's demand. Studies highlight the lack of infrastructure, scarcity of materials, and work overload of professionals as key barriers to quality care.

**Keywords:** Dentistry; Unified Health System (SUS); Technology; Supplies; Acquisition.

## INTRODUCTION

Health care organization in Brazil is historically divided into two distinct periods: before and after the enactment of the Federal Constitution in 1988. This legal milestone marked a turning point in public health policy, establishing universal access to health services and consolidating the Brazilian Unified Health System (Sistema Único de Saúde – SUS). Prior to this period, only certain groups had access to health services, and state efforts were primarily directed toward the absence of disease. After 1988, municipalities assumed the role of principal implementers of health policy, addressing cultural, economic, and social diversity, and ensuring continuous and equitable access to (Brasil, 2000).



In order to structure oral health care, the Ministry of Health established the National Oral Health Policy Guidelines (Diretrizes da Política Nacional de Saúde Bucal – PNSB) in 2004. The aim was to ensure support to oral health teams working with Family Health Strategy (Estratégia Saúde da Família – ESF), provide continuous professional training, promote and fund research focused on the challenges of health promotion, and improve the products and technologies used in public services. The guiding principles of Universality, Comprehensiveness, and Equity form the ethical foundation for participatory health management involving users, professionals, and government administrators, ensuring collective and comprehensive access to general and oral health, especially in cases of urgency and emergency (Ministério da Saúde, 2004).

SUS guidelines promote interdisciplinary and multiprofessional approaches among health teams to expand health promotion and disease prevention initiatives. Furthermore, they recommend strengthening basic care for emergency services and ensuring dignified, safe, and healthy working conditions for health professionals through the supply of appropriate instruments, consumables, and equipment maintenance. Ministry of Health Ordinance No. 2.372, dated October 7, 2009, establishes minimum requirements for the implementation of dental offices within the Oral Health Teams (Equipes de Saúde Bucal – ESB) of the Family Health Strategy. Its objective is to improve oral health epidemiological indicators by ensuring the availability of essential equipment, such as a complete dental unit and a handpiece kit (Ministério da Saúde, 2020).

Despite these initiatives, the scientific literature reveals a scarcity of information concerning the need for acquisition and renovation of equipment used for diagnosis, treatment, and prevention of oral diseases in public dental services. Therefore, this literature review aims to highlight the relevance of updating dental technologies within the scope of SUS.

## METHODOLOGY

This study was conducted through a literature review, based on an active search for publications on the BIREME, LILACS, and Google Scholar platforms, without restrictions regarding publication period or language. The official website of the Brazilian Ministry of Health was also consulted.



The keywords used were: “odontologia” (dentistry), “SUS” (Unified Health System), “tecnologia” (technology), “insumos” (supplies), and “aquisição” (acquisition). The search retrieved 17 articles from BIREME, 12 from LILACS, and 20 articles and 3 monographs from Google Scholar. In addition, 20 official documents from the Ministry of Health were included.

Titles and abstracts were evaluated, and those aligned with the objectives of this review were selected. Exclusion criteria included duplicate publications, topics unrelated to the objective, and documents not available in full text. The final sample consisted of 24 scientific articles, 3 monographs, and 20 official documents.

## THEORETICAL FRAMEWORK

### The Brazilian Unified Health System (Sistema Único de Saúde – SUS)

Given the healthcare deficiencies observed prior to the promulgation of the 1988 Federal Constitution (Constituição Federal do Brasil – CFB) and the way the state previously approached public health issues, it became evident that ensuring quality healthcare should be a duty of the State and a right guaranteed to all citizens. This right was established through Article 196 of the CFB, which considered the cultural, economic, and social conditions present throughout the country. Thus, in 1990, the Unified Health System (Sistema Único de Saúde – SUS) was regulated as a universal healthcare program, accessible to every Brazilian citizen across the national territory. SUS became responsible for guaranteeing access to health services, ranging from

primary care to high-complexity interventions. Its creation was based on the foundational principles of Universality, Comprehensiveness, and Equity (Soares de Sá, 2020).

Over time, SUS has been consolidated through the individualized care provided to patients, characterized by family-centered assistance—from prevention to curative care—offering humane and quality service. In pursuit of continuous improvement, various updates were made to the Basic Operational Norms (Normas Operacionais Básicas – NOB), along with new resolutions and ordinances that strengthened health and primary care services. SUS could not have become a reality without the involvement of all levels of government: federal, state, and municipal. Each level contributes to healthcare service provision and financing. A percentage of tax revenue collected by each level is allocated specifically to health-related actions (Soares De Sá, 2020).



With a new approach to Primary Health Care (Atenção Básica de Saúde – ABS), encompassing promotion, prevention, diagnosis, treatment, rehabilitation, and sanitary conditions, the Family Health Program (Programa Saúde da Família – PSF) was created. Its foundational principles include equitable access to quality healthcare, user-centered care, development of lasting and affective bonds between patients and professionals, and enhanced user autonomy (Ministério da Saúde, 2012).

The PSF quickly became a key organizational strategy in Brazil's public health system, aimed at achieving better outcomes with lower costs by focusing on primary care. This strategy allowed for the expansion, qualification, and consolidation of basic health services, increasing the capacity to address common health problems (Ministério da Saúde, 2012; Mendonça, 2009).

In 2004, the National Oral Health Policy (Política Nacional de Saúde Bucal – PNSB), known as "Brasil Sorridente" (Smiling Brazil – BS), was established to allocate resources and define priorities for oral health programs within SUS. Its objective was to expand access to oral health services through the implementation of Oral Health Teams (Equipes de Saúde Bucal – ESB) integrated into the Family Health Teams (Equipes de Saúde da Família – ESF), and the expansion of Dental Specialty Centers (Centros de Especialidades Odontológicas – CEO) and Regional Dental Prosthesis

Laboratories (Laboratórios Regionais de Prótese Dentária – LRPD) (Brasil, 2016; 2018).

According to Rocha and Araújo (2009), the inclusion of ESBs in primary care units represented a shift in paradigms, adding value to the care provided, promoting a more humane and accessible approach for the population, and aiming to increase the effectiveness of the oral health model proposed by the Ministry of Health. However, it is understood that several variables still need to be analyzed to better understand the clinical routine and working conditions of dental professionals within SUS.



**The Importance of Technology for the Development of Dentistry**

In recent decades, dentistry and information technology have significantly transformed clinical procedures and the scientific knowledge surrounding oral health. As dental technologies continue to evolve rapidly, the digitalization of research processes has also enhanced the speed and integration of scientific discoveries (Correia et al., 2008).

Digital platforms, systems, and mobile devices have facilitated access to faster, more effective, and reliable information. With these advances, dentistry has become one of the healthcare fields most affected by technological progress, contributing to more precise diagnoses that were once unimaginable. The constant updating of dental equipment and technologies has increased diagnostic accuracy, optimized professional performance, reduced chair time, and even lowered overall operational costs. The acquisition of information systems today is no longer optional but essential. Such systems, when combined with marketing strategies, can elevate the professional visibility of dentists in a competitive job market (Viola; Oliveira; Dotta, 2011).

Smartphones have also become indispensable tools for dental professionals, improving service quality by providing immediate access to pathology databases, digital clinical records, patient monitoring, image exams with high resolution, and intraoral photography—an essential tool for clinical planning and treatment (Silva, 2017).

Among the technological devices that have facilitated dental practice, automated equipment stands out for enhancing clinical application, making procedures more efficient and practical. Essential equipment includes ultrasonic

scalers, air polishers, amalgamators, steam autoclaves, appropriate packaging for sterilized instruments, light-curing units, and radiographic systems. However, the application of advanced technologies in dental clinics does not eliminate the need for professional training. The more complex the patient's condition, the greater the demand for technical knowledge and continued education. Thus, ongoing professional qualification and the pursuit of updated scientific knowledge are indispensable (Silva, 2017).

Dental care extends beyond esthetic outcomes. It involves restoring the full functionality of the stomatognathic system using appropriate technologies to achieve more reliable and safer treatment outcomes for both patients and professionals. Healthcare outcomes have improved alongside technological progress, reducing errors and enhancing clinical safety (Rosenthal, 2001).



**Acquisition of Technologies for Dental Care within SUS**

Basic Health Units (Unidades Básicas de Saúde – UBS) follow a structural manual that defines their physical environment according to service demands. This includes adequate electrical and hydraulic systems, proper ventilation, and lighting. Although no rigid architectural standards are enforced, spaces must be organized for shared and interdisciplinary use. UBSs are also required to provide high-quality supplies that match service demands and to ensure effective cleaning and disinfection protocols (Gerlack, 2015).

The acquisition of dental materials, supplies, and technologies by public administration is carried out through public procurement processes. These processes allow the selection of the best cost-benefit options among various suppliers and service providers. Procurement may occur through methods such as open bidding, price quotations, invitations, public contests, auctions, and electronic bidding (pregão eletrônico). The frequency of acquisitions depends on effective planning and management within each health unit, as well as on delivery schedules, product quality, and expiration dates (Justen Filho, 1994; Gerlack, 2015).

As the profession evolves, dentistry continues to incorporate new technologies into public health services, both for collective health initiatives and individual primary care actions. This improves service quality, increases procedural efficiency, and

reduces clinical time. These benefits justify the inclusion of auxiliary equipment in primary care, encompassing physical infrastructure improvements, equipment, materials, instruments, and medications (Gerlack, 2015).

In a study by Rocha and Araújo (2009), the availability and replacement of equipment and supplies in UBSs in Natal, Rio Grande do Norte, were reported to be regular and of good quality. The equipment was found to be modern and well-maintained, and the replenishment of materials, instruments, and personal protective equipment (PPE) occurred consistently. However, the authors noted a lack of materials for oral health education and prevention efforts, which represents a significant barrier to comprehensive population care.



The study further emphasized that the most frequently reported obstacles to the development of Oral Health Teams (ESB) included delays or inefficiencies in equipment maintenance, shortage of supplies, lack of equipment for collective actions, and inadequate physical infrastructure. Additional concerns impacting service delivery included the absence of air conditioning and inadequate sanitation of the clinical environment (Rocha & Araújo, 2009).

## DISCUSSION

The Brazilian Ministry of Health (2004) emphasized that the promotion of oral health through the guidelines and policies of the Unified Health System (Sistema Único de Saúde – SUS / Unified Health System – UHS) aims to minimize health risks by improving working conditions, education, leisure, and access to cultural resources. According to Barros and Botazzo (2008), in public dental services, the diagnosis, treatment, and prevention of oral diseases are directly dependent on the availability of equipment, materials, and most importantly, the professional knowledge of the dental practitioner.

The Family Health Team (Equipe de Saúde da Família – ESF / Family Health Strategy – FHS) includes a family physician, two nurses, three nursing assistants or technicians, four community health agents, one dental surgeon, and one dental assistant or technician. Dental professionals are responsible for health promotion, prevention, diagnosis, treatment, and rehabilitation of oral diseases. According to the National Oral Health Policy Guidelines (2004), oral health promotion and disease

prevention are achieved through public health actions such as water fluoridation, fluoride toothpaste usage, and access to basic sanitation.

The diagnosis and treatment of oral pathologies fall under curative activities and require financial investment in equipment and supplies, as described in the Primary Care Handbook No. 17 (2008). The federal government provides a list of dental supplies through the Family Health Pharmacy based on municipal needs; however, the resources offered are often insufficient to ensure the proper execution of dental procedures. The Secretariat for Health Care (2004) states that budget allocation for oral health care is based on population size in each municipality. Funds are primarily allocated to preventive practices and material acquisition, but they often fail to meet the actual demand for public dental services.



According to the National Program for Improving Primary Care Access and Quality (PMAQ) and Scalzo (2019), the dental equipment provided to health units includes amalgamators, dental X-ray machines, autoclaves, lead aprons, dental chairs, darkrooms, compressors with safety valves, cuspidors, dry-heat sterilizers, dental units with high- and low-speed handpieces, curing lights, bicarbonate jets, operator stools, film viewers, operatory lights, sealing machines, and ultrasonic scalers. The available materials include adhesives, amalgam (in capsules and manually prepared), anesthetics (with or without vasoconstrictors and topical), various types of burs, sharps containers, cements, wedges, sutures, fluoride gel, radiographic fixers and developers, scalpel blades, matrices, temporary restorative materials, intracanal medicaments, carbon paper, light-curable resins, and sealants. In addition, disposable supplies such as personal protective equipment (PPE), gauze, microbrushes, cotton rolls, and irrigation syringes are made available.

Instruments provided by Ministerial Ordinance No. 2.372 of October 7, 2009, include elevators, forceps, mirrors, scalers, spatulas, surgical instruments, and educational tools such as dental mannequins and oversized toothbrushes. Despite these provisions, technological innovations in dentistry have advanced considerably in recent decades, enhancing the speed and precision of procedures. Technologies such as digital radiography, intraoral cameras, and electronic apex locators could be integrated into the SUS, significantly improving clinical performance (Dotta & Spinol, 2003; MacDonald, 2001).

Frazão and Narvai (2009), along with the Ministry of Health (2018), assert that the public sector aims to deliver high-quality dental care, especially through Primary Health Care and Dental Specialty Centers (Centros de Especialidades Odontológicas – CEOs / Dental Specialty Centers – DSCs). Services offered in these centers include diagnosis, specialized periodontics, minor oral surgery, endodontics, treatment for patients with special needs, prosthetic services, and radiology. The establishment and management of CEOs involve federal, state, and municipal collaboration and are categorized into three types based on the number of dental chairs available. Type I CEOs have three chairs, Type II have four to six, and Type III have seven or more (Machado, Silva, Ferreira, 2015; Brazil, 2006).



Boareto (2011), the Ministry of Health (2017), and Campos et al. (2014) explain that Type I Oral Health Teams consist of one dental surgeon and one dental assistant or technician, while Type II teams include one dental surgeon, one assistant, and two technicians. Each CEO requires effective administrative support—such as administrative aides, general service staff, and receptionists—to maintain operational efficiency. Ministerial Ordinance GM/MS No. 1.464 of June 24, 2011, mandates a minimum number of procedures for each type of CEO to perform, ranging from 80 to 190 basic procedures and varying numbers for periodontics, endodontics, and oral surgery depending on the CEO type.

The SUS database on Hospital Information Systems (SIH) and the Procedure Management System (SIGTAP) define procedures for dental surgeons, including pulpotomies, topical fluoride application, restorations, minor surgeries, prosthesis installation, and patient education, among many others. In 2020, Ordinance No. 526 further updated the list of procedures, materials, and technologies permitted in public health dental practice, expanding the scope of services such as teleconsultation, orthodontic appliance maintenance, cancer prevention, patient monitoring, and behavioral guidance.

Despite advances, the Family Health Program, which includes oral health care, faces serious challenges such as limited material acquisition, budget constraints, lack of personnel, insufficient professional training programs, and obsolete or inadequate equipment. These deficiencies compromise patient care and restrict access to high-quality services (Lourenço et al., 2009).

Although the government has invested in dental care infrastructure through the expansion of UBS and CEOs, it is still insufficient to meet population demands. Pezzato, L'Abbate, and Botazzo (2013) argue that the acquisition of new products and technologies is necessary to keep up with the dental market and improve public service delivery. Regular monitoring and evaluations of the CEOs are essential to identify areas needing repair or investment and to support effective health planning (Felisberto et al., 2017; Ferreira et al., 2018).



Santana (1997) adds that systemic limitations, including technological and financial constraints, impede adequate service delivery. Pedrosa (2011) notes that shortages in materials and supplies directly impact the clinical performance of dentists, resulting in substandard care. Similarly, Melo, Braga, and Forte (2011) observed that inadequate infrastructure and insufficient material availability are among the reasons patients miss scheduled appointments. Pedrosa, Corrêa, and Mandú (2011), supported by Ordinance No. 2.488 of 2011, highlight that many SUS facilities fail to meet the system's basic standards.

A study by Rocha and Araújo (2009) in Natal, RN, found that the lack of ongoing professional training, inadequate facilities, excessive patient demand, and absence of interdisciplinary staff are major barriers to implementing the oral health actions outlined by the Ministry of Health. According to Machado and Pereira (2002), PSF professionals face high workloads due to staff shortages, limited materials and medications, and low wages, which combined with a weak referral system, lead to burnout. Despite federal funding to improve services, the amount allocated is insufficient to cover the costs of materials, instrument maintenance, and technology acquisition.

Nonetheless, Uchimura and Bosi (2002) emphasize that professional competence should not be reduced to access to tools alone. Ethical awareness, humanistic values, and a broad understanding of oral and general health are equally vital. According to Brazil (2018), dentistry should shape professionals who are generalists, humanists, educators, and capable of working in multidisciplinary teams to promote, prevent, and restore health across all levels of care.

## CONCLUSION

It is concluded that the incorporation of technology and technological devices in clinical dentistry facilitates procedures, making them more practical and faster, reducing errors, increasing safety, and improving communication between the patient and the professional. However, the Unified Health System (Sistema Único de Saúde – SUS / Unified Health System – UHS) faces significant challenges in acquiring new equipment, materials, and supplies funded by the federal government. This situation directly impacts the clinical practice of dental surgeons, compromising the quality of care provided to the population and creating barriers to adequate treatment, thereby limiting the delivery of high-quality services. Research on this topic remains scarce and deserves greater attention, especially considering that SUS is a healthcare program designed to serve the entire population.



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