

Health Systems and the Financial Impact of Dental Treatment in Cancer

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Abstract— The Brazilian Health care System is Universalist, where the treatment of patients with cancer is full and free, secured by law with the obligation to be initiated within sixty days of its diagnosis. The regulation of antineoplastic therapy and the hospital network that is licenced and certified for the treatment of cancer is standardized by the Ministry of Health / National Cancer Institute José Alencar Gomes da Silva [Instituto Nacional de Câncer José Alencar Gomes da Silva] (INCA). Dental care in cancer patients is mandatory to prevent and treat oral complications; whose protocol is standardized by INCA to be applied throughout the hospital network enabled in oncotherapy. **Objective:** A study of the dental treatment was carried out in patients diagnosed with cancer attended at a High Complexity Oncology Care Unit / Unidade de Assistência de Alta Complexidade em Oncologia (UNACON) in order to evaluate the financial impact of oral care in oncotherapy. **Material and Method:** Evaluation of the medical records of patients treated at the Oncological Dentistry Service (SODONCO) of UNACON of the General Hospital of Palmas (HGP) / Tocantins (TO) from April 2011 to December 2016. **Results:** A total of 607 medical records were reviewed, showing a significant financial impact in dental treatment in oncotherapy. **Conclusion:** The study shows the importance of standardizing the oral care protocol in oncotherapy, the organization of a structured database for the registration of dental treatment, in spite of carrying out the planning of human and financial resources for dental treatment in cancer patients.

Keywords— Cancer therapy, Cancer treatment protocols, Health systems, Oral complications.

I. INTRODUCTION

The Constitution of 1988 of the Federal Republic of Brazil in the articles 196 to 200 defines the legal framework of the Unified Health System / Sistema Único de Saúde (SUS), and establishes that: "... Health is a right of all and a duty of the State"; and in concomitance with the Organic Health Laws, Law 8.080 / 1990 and Law 8.142 / 1990 establishes the competencies, governmental powers and guidelines for the SUS: decentralization, integrality, and community participation through municipal, state and national health¹ councils. Dental treatment is offered to all users of the System free of charge in Primary Care (preventive actions); in Secondary Care at the Centers of Dental Specialties-CDS (restorations, periodontics, endodontics, prostheses, orthodontics, implantology and minor oral surgery); and in

Tertiary Care in a hospital environment (traumatology, special patients, cleft lip and palate, oncology)¹⁻³.

The National Cancer Institute José Alencar Gomes / Instituto Nacional de Câncer José Alencar Gomes da Silva (INCA) is the government agency responsible to assist the Ministry of Health (MH) in the formulation of the National Policy for the Prevention and Cancer Control / Política Nacional de Prevenção e Controle do Câncer (PNPCC)⁴; having as free integral mandatory dental treatment to the oncologic patient⁵, and the beginning of the antineoplastic therapy within sixty days of its diagnosis⁶.

In order to improve and standardize the dental treatment for cancer patients, a protocol of oral care and dental procedures was published in 1990 by INCA to be applied throughout the hospital network enabled in oncotherapy⁷.

Hemorrhage, infection (bacterial, viral, fungal), mucositis, xerostomia, radiation caries, trismus, avascular osteonecrosis, osteoradionecrosis, periodontal changes, dental and craniofacial development are oral complications that may occur during and after anticancer therapy⁸⁻¹⁴. These effects may lead to temporary or permanent discontinuation of treatment, impairment of disease control, and overall survival rates^{15,16}. Prevention and treatment of oral complications of antineoplastic therapy are important to increase quality of life, reduce morbidity and treatment costs¹⁷⁻²⁵.

Canada has a Health System that guarantees universal access and coverage, described as an interwoven set of ten provincial and three territorial health insurance plans; with few public subsidies for access to dental care²⁶. It presents twenty-four centers specialized in oncotherapy; and only six provide dental treatment without a defined protocol; the other centers provide oral care through universities and non-governmental organizations^{27,28}.

The US Health System consists of government programs targeting the low-income population (Medicaid), and individuals over 65 (Medicare), with only 6% of dental care funded by public agencies^{29,30}. The National Cancer Institute (NCI) licenses cancer centers for their ability to conduct oncology research. Despite the rigorous evaluation of the NCI to grant the qualification in Cancer Integral Center, they do not have a common protocol defined for the prevention and treatment of oral complications due to oncotherapy³¹⁻³⁴.

Spain has a National Health System (NHS) of universal coverage, promulgated by the Spanish Constitution of 1978, supported by the General Health Act (14 of 1986). The full cancer treatment is carried out in specialized care, where most of the Oncology Centers have Dental Service at their facilities³⁵⁻³⁷; wherein a research conducted in the nine University Hospitals of the region of Madrid observed a great diversity regarding the management of the oral care in patients irradiated in the region of head and neck³⁸.

The Norwegian Health System has universal coverage, with free public dental care for children and young people aged 0-18. Youth 19-20 years must pay 25% of costs. Mentally disabled adults, the elderly and people with chronic illness pay reduced rates³⁹; whereas for adult survivors with dental and orofacial consequences, effects of antineoplastic therapy of acute lymphoblastic leukemia (ALL), which occurred during childhood and youth, the health system of Norway does not provide free dental treatment, since it considers that the patients are free of the disease^{40,41}.

Sweden has a Universal Health System under the Health and Medical Services Act 1982. Dental care is provided by the Public Dental Service and by private care providers; which are free for people under 20 years of age and out of the pocket for others, with a higher contribution rate between 20-29 and over 75 years⁴². Recently, the Swedish government has initiated a national reform to standardize the flow of cancer patient care in order to regulate cancer treatment, reduce waiting times for oncotherapy, and minimize regional inequalities⁴³.

The UK National Health Service (NHS) was created in 1948, of universal feature, where patients must pay an out of the pocket fee for dental treatment which varies according to the complexity of the same⁴⁴. England has 56 multidisciplinary teams treating head and neck cancer; which do not comply with the oral care protocol for patients undergoing head and neck radiation therapy recommended by the National Institute for Health and Clinical Excellence (NICE)^{45,46}.

In view of the significant demand for dental care for cancer patients and the financial resources allocated to this action, a study of dental treatment was carried out in patients diagnosed with cancer attended at a High Complexity Oncology Care Unit / *Unidade de Assistência de Alta Complexidade em Oncologia* (UNACON) aiming at improving the public health policies of oral care in oncotherapy.

II. MATERIAL AND METHODS

The design of this study is descriptive, observational.

A survey was performed in the files of the Oncological Dentistry Service of the General Hospital of Palmas / Tocantins, from patients diagnosed with cancer treated from April 2011 to December 2016.

The protocol of this research, through the Brazil Platform, was submitted to a Research Ethics Committee (REC), in accordance with the directives and norms regulating research involving human beings issued by Resolution No. 466 of December 12, 2012, of the National Health Council⁴⁷, hence, obtaining a favorable consolidated opinion from the REC with the number 1,402,219.

Data from each patient were computed on a database table structured in the Excel program (2013) for Windows⁴⁸, according to Dental Procedure (DP) (Table 1), and Dental Procedure for Tooth (DPT) (Table 2).

Oral care and dental treatment were performed in accordance with the guidelines established by INCA⁷.

The structured database table was made in continuous line in the following order: PO.1 to PO.31; tooth 51-55; tooth 61-65; tooth 71-75; tooth 11-18; tooth 21-28; tooth 31-38; tooth 41-48.

A descriptive statistical analysis of the data was performed.

For the evaluation of the financial impact of DP and DPT, a comparison was made between the values of the dental procedures included in the Unified Table of the Management System of Procedures, Medications and OPM of SUS (SIGTAP)^{1,49}, with the values of the Table of Reference Values for Dental Procedures [*Valores Referenciais para Procedimentos Odontológicos*] / Syndicate of Odontologists of the State of São Paulo [*Sindicato dos Odontologistas do Estado de São Paulo*] (VRPO / SOESP), edition 2016, of the National Commission of Accredited Agreements⁵⁰; and the UTSH (Unified Terminology of Supplementary Health) table of the National Agency of Supplementary Health-ANS⁵¹

Table 1 - Dental Procedure (DP)

DP.1- initial dental consultation / clinical examination
DP.2- return
DP.3- panoramic radiography
DP.4- periapical radiography
DP.5- computed tomography
DP.6- magnetic resonance imaging
DP.7- ultrasonography
DP.8- preventive procedures / prophylaxis
DP.9- individual educational activity
DP.10- educational guidance of radiotherapy / chemotherapy
DP.11- topical application of fluoride by hemi-arch
DP.12- supra-gingival scraping by hemi-arch
DP.13- subgingival hemi-arcade scraping
DP.14- alveoloplasty by hemi-arch
DP.15- maxillary molding with alginate
DP.16- jaw molding with alginate
DP.17- individual maxillary tray for fluoride
DP.18- individual law tray for fluoride
DP.19- removable partial denture maxilla
DP.20- removable partial denture jaw

DP.21- maxillary total prosthesis
DP.22- jaw total prosthesis
DP.23- low power laser therapy
DP.24- biopsy
DP.25- prosthesis relining
DP.26- desensitization hemi-arch
DP.27- abscess drainage
DP.28- maxillary sealing plate
DP.29- resin eyelid prosthesis
DP.30- silicone eyelid prosthesis
DP.31- silicone nasal prosthesis

Table 2 - Dental Procedure per Tooth (DPT)

DPT.1- sealant by dental element
DPT.2- deciduous tooth restoration with glass ionomer by element
DPT.3- deciduous tooth restoration with amalgam by element
DPT.4- deciduous tooth restoration with photopolymerizable resin component
DPT.5- endodontic treatment in deciduous tooth
DPT.6- pulpotomy
DPT.7- extraction of deciduous tooth
DPT.8- restoration of amalgam 01 face in permanent tooth per element
DPT.9- restoration of amalgam 02 faces in permanent tooth per element
DPT.10- restoration of amalgam 03 faces in permanent tooth per element
DPT.11- restoration of amalgam 04 faces in permanent tooth per element
DPT.12- restoration in photopolymerizable resin in permanent tooth 01 face per element
DPT.13- restoration in photopolymerizable resin in permanent tooth 02 face per element
DPT.14- restoration in photopolymerizable resin in permanent tooth 03 face per element
DPT.15- restoration in photopolymerizable resin in permanent tooth 04 face per element
DPT.16- restoration of permanent tooth with glass

ionomer per element
DPT.17- permanent tooth endodontic treatment uni
DPT.18- permanent tooth endodontic treatment bi
DPT.19- permanent tooth endodontic treatment tri
DPT.20- permanent tooth endodontic retreatment uni
DPT.21- permanent tooth endodontic retreatment bi
DPT.22- permanent tooth endodontic retreatment tri
DPT.23- delay dressing
DPT.24- intra core
DPT.25- permanent tooth extraction
DPT.26- residual root extraction
DPT.27- retained tooth extraction
DPT.28- temporary crown
DPT.29- unitary dental prosthesis (total crown, inlay, onlay)
DPT -30- alveolitis treatment per tooth
DPT.31- root burial
DPT.32- splitting by element
DPT.33- crown with post
DPT -34- clinical crown increase

III. RESULTS

The DP and DPT (deciduous and permanent dentition) of 607 records of the Oncological Dentistry Service of the General Hospital of Palmas / Tocantins (SODONCO / HGP / TO) were analyzed.

In the period from 2011 to 2016 in SODONCO / HGP / TO, 607 initial dental consultations (DP.1) were performed; 1799 returns (DP.2); totaling 2406 appointments; with an average of four visits per patient to complete the proposed dental treatment.

The complete distribution of DPs performed, and the comparison of the financial impact between the VRPO / SIGTAP / TUSS tables can be observed in Table 3, where we can highlight 543 of DP.3; 316 of DP.8; 371 of DP.9; 223 of DP.10; 375 of DP.11; 769 of DP.12; 682 of DP.13; and 229 of DP.23.

Regarding DPT in deciduous dentition, 196 procedures were performed, with relevance for 30 restorations with glass ionomer (DPT.2); 79 restorations with photopolymerizable resin (DPT.4); and 66 dental extractions (DPT.7). The disposition of DPT in the deciduous dentition, and the comparison of the financial

impact between the VRPO / SIGTAP tables can be visualized in Table 4.

2310 DPT were produced in permanent dentition, with emphasis on 932 restorations on single and double-face light-curing resin (DPT.12 + DPT.13); 153 glass ionomer restorations (DPT.16); 740 dental extractions (DPT.25); and 103 residual root extracts (DPT.26). The organization of DPT in permanent dentition, and the comparison of the financial impact between the VRPO / SIGTAP tables can be examined in Table 5

IV. DISCUSSION

In Brazil, the treatment of patients with malignant neoplasm is a right guaranteed by Law¹ and regulated by the Ministry of Health⁵; in contrast, in the countries studied, the access and initiation of oncoterapeutic treatment, as well as the right of patients to anti-neoplastic therapy, do not follow the standard and regulation defined according to their respective health reports^{26,30,35-37,42,44} and studies^{14,28,37,43}.

The Brazilian Health System is of predominantly universalist characteristic with a financial transfer from the Union to States and Cities¹; yet the dental procedures for antineoplastic therapy are considered highly complex, but billed by the federal sphere, with a basic care chart^{1,49}; highlighting a lack of a financial health policy for oral oncoterapy on the part of the Ministry of Health; In relation to the Health Systems analyzed, there is a mixture of the Universalist System with Social Security Model and the Assistencialist Model^{26,29,30,35,39,42-44}, where their respective health reports describe the out of the pocket system of dental treatment to the general population, lacking further explanations in relation to cancer patients^{10,28,29,32,40,46}.

In Brazil, the protocol of dental treatment and oral care in the antineoplastic therapy is standardized to be performed in the entire hospital network enabled in oncoterapy^{5,7}; in agreement with the authors analyzed who corroborate that oral care in oncoterapy should be standardized and followed by cancer treatment centers^{8-15,20-25,27,45,46}; evidencing that the international community still argues which best protocol deserves to be implemented and applied in the analyzed Health Systems in the World^{8-11,13-25,20-25,27,28,45,46}; sharing the importance of the standardization of dental treatment in oncoterapy; to increase the quality of life, the reduction in complications that can delay or stop oncoterapy^{19,32-34,41} thus interfering in cancer treatment costs^{10,12,15-18,24,32,40}; and stimulating the elaboration, by the nations, of public health and

financial policies to ease the access of the cancer patient to the dental care and costing of the same^{10,13,17,29,36,38,40,45,46}.

Hence, the research carried out contributes to the world scientific scenario, since it follows and applies the national cancer care policy advocated by the Federal Government and the Ministry of Health, encouraging in Health Systems in the World, the elaboration and standardization of protocol for oral care in antineoplastic therapy, and the planning of human and financial resources for dental treatment in cancer patients.

V. CONCLUSION

The study reveals the importance of a structured database for the individualized registry of dental treatment performed in patients diagnosed with cancer; in order to promote the development and standardization of the oral care protocol in antineoplastic therapy in the World Health Systems, the planning of human and financial resources for dental treatment in cancer patients, and the elaboration of public policies to improve the right and access of cancer patients to dental therapy in oncotherapy.

Table 3 - Distribution of DP and comparison of financial impact between tables VRPO / SIGTAP / TUSS

DP	2011/2016	VRPO*	VRPO*	SIGTAP**	SIGTAP**	TUSS***	TUSS***
DP.1	607	R\$ 110,45	R\$ 67.043,15	R\$ 6,30	R\$ 3.824,10		
DP.2	1799	R\$ 110,45	R\$ 198.699,55	R\$ 6,30	R\$ 11.333,70		
DP.3	545	R\$ 84,92	R\$ 46.281,40	R\$ 9,03	R\$ 4.921,35		
DP.4	114	R\$ 22,85	R\$ 2.604,90	R\$ 1,75	R\$ 199,50		
DP.5				R\$ 86,75	R\$ 1.214,50	R\$ 247,62	R\$ 3.466,68
DP.7	3			R\$ 24,20	R\$ 76,60	R\$ 56,06	R\$ 168,18
DP.8	316	R\$ 100,83	R\$ 31.862,28				
DP.9	371	R\$ 72,74	R\$ 26.986,54				
DP.11	375	R\$ 59,27	R\$ 5.556,56				
DP.12	769	R\$ 122,47	R\$ 94.179,43	R\$ 1,24	R\$ 953,56		
DP.13	682	R\$ 162,60	R\$ 110.893,20	R\$ 1,24	R\$ 845,68		
DP.14	23	R\$ 170,01	R\$ 3.910,23	R\$ 12,98	R\$ 298,54		
DP.15/16	261	R\$ 98,16	R\$ 12.809,88				
DP.17	119			R\$ 23,54	R\$ 2.801,26		
DP.18	136			R\$ 23,54	R\$ 3.201,44		
DP.19	4	R\$ 668,19	R\$ 2.672,76	R\$ 150,00	R\$ 600,00		
DP.20	2	R\$ 668,19	R\$ 1.336,38	R\$ 150,00	R\$ 300,00		
DP.21	4	R\$ 1.496,06	R\$ 5.984,24	R\$ 150,00	R\$ 600,00		
DP.22	2	R\$ 1.496,06	R\$ 2.992,12	R\$ 150,00	R\$ 300,00		
DP.23	229					R\$ 130,05	R\$ 29.781,45
DP.24	10	R\$ 172,56	R\$ 1.725,60				
DP.25	12	R\$ 348,66	R\$ 4.183,92	R\$ 1,16	R\$ 13,92		
DP.26	16	R\$ 77,57	R\$ 1.241,12				

DP.27	3	R\$ 104,28	R\$ 312,84				
DP.29	1			R\$ 61,19	R\$ 61,19		
DP.30	1			R\$ 61,19	R\$ 61,19		
DP.31	1			R\$ 61,19	R\$ 61,19		
TOTAL			R\$ 621.276,10		R\$ 31.663,72		R\$ 33.416,31
TOTAL			US\$ 117,001.15		US\$ 5,963.04		US\$ 6,293.09

Source: SODONCO/HGP/TO (2016)

01US\$ (American Dollar) = 5,31 R\$ (Brazilian Real)

Table 4 - Disposition of DPT in deciduous dentition and comparison of financial impact between tables VRPO / SIGTAP

DPT	2011/2016	VRPO*	VRPO*	SIGTAP**	SIGTAP**
DPT.1	7	R\$ 68,10	R\$ 476,70		
DPT.2	30	R\$ 107,77	R\$ 3.233,10	R\$ 0,00	R\$ 0,00
DPT.4	79			R\$ 0,00	R\$ 0,00
DPT.5	4	R\$ 250,00	R\$ 1.000,56	R\$ 5,59	R\$ 22,36
DPT.6	3	R\$ 140,17	R\$ 420,51		
DPT.7	66	R\$ 83,00	R\$ 5.498,46	R\$ 0,00	R\$ 0,00
DPT.23	1	R\$ 181,86	R\$ 181,86	R\$ 0,00	R\$ 0,00
DPT.31	6	R\$ 65,96	R\$ 395,74		
TOTAL			R\$ 11.206,93		R\$ 22,36
TOTAL			US\$ 2,110.53		US\$ 4.21

Source: SODONCO/HGP/TO (2016)

01US\$ (American Dollar) = 5,31 R\$ (Brazilian Real)

Table 5 - Organization of POD in permanent dentition and comparison of financial impact between tables VRPO / SIGTAP

DPT	2011/2016	VRPO*	VRPO*	SIGTAP*	SIGTAP**
DPT.01	79	R\$ 68,10	R\$ 5.379,90	*	
DPT.12	723	R\$ 112,90	R\$ 81.626,70	R\$ 0,00	R\$ 0,00
DPT.13	209	R\$ 166,45	R\$ 34.788,05	R\$ 0,00	R\$ 0,00
DPT.14	87	R\$ 166,45	R\$ 14.481,15	R\$ 0,00	R\$ 0,00
DPT.15	33	R\$ 166,45	R\$ 5.492,85	R\$ 0,00	R\$ 0,00
DPT.16	153	R\$ 107,77	R\$ 16.488,81	R\$ 0,00	R\$ 0,00
DPT.17	36	R\$ 328,13	R\$ 11.812,68	R\$ 4,41	R\$ 158,76
DPT.18	5	R\$ 388,34	R\$ 1.941,70	R\$ 5,71	R\$ 28,55
DPT.19	24	R\$ 624,88	R\$ 14.997,12	R\$ 6,95	R\$ 166,80
DPT.20	3	R\$ 353,46	R\$ 1.060,38	R\$ 4,41	R\$ 13,23
DPT.21	3	R\$ 482,94	R\$ 1.448,82	R\$ 5,71	R\$ 17,13
DPT.22	1	R\$ 814,08	R\$ 814,08	R\$ 6,95	R\$ 6,95
DPT.23	57	R\$ 181,86	R\$ 10.366,02	R\$ 0,00	R\$ 0,00

DPT.24	1	R\$ 147,26	R\$ 147,26		
DPT.25	740	R\$ 126,06	R\$ 93.284,40	R\$ 0,00	R\$ 0,00
DPT.26	103	R\$ 127,95	R\$ 13.178,85		
DPT.27	26	R\$ 297,48	R\$ 7.734,48	R\$ 22,00	R\$ 590,72
DPT.28	13	R\$ 138,66	R\$ 1.802,58	R\$ 23,54	R\$ 306,02
DPT.29	1	R\$ 688,20	R\$ 688,20	R\$ 150,00	R\$ 150,00
DPT.31	1	R\$ 260,51	R\$ 260,51		
DPT.32	7	R\$ 65,96	R\$ 461,70		
DPT.33	3	R\$ 699,67	R\$ 2.099,01	R\$ 150,00	R\$ 450,00
DPT.34	2	R\$ 254,27	R\$ 508,54		
TOTAL			R\$ 320.863,79		R\$ 1.888,16
TOTAL			US\$ 60,426.32		US\$ 355.58

Source: SODONCO/HGP/TO (2016) 01US\$ (American Dollar) = 5,31 R\$ (Brazilian Real)

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