

## PROFILE OF THE DEMAND ASSISTED BY A TEAM OF ORAL AND MAXILLOFACIAL SURGEONS IN THE CITY OF CUIABÁ, BRAZIL: A TIME-SERIES STUDY

### *PERFIL DA DEMANDA ATENDIDA POR UMA EQUIPE DE CIRURGIÕES BUCOMAXILOFACIAL EM CUIABÁ, BRASIL: UM ESTUDO DE SÉRIE TEMPORAL*

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**ABSTRACT:** The present study aimed to characterize the procedures performed by the oral and maxillofacial surgery team at a Brazilian reference hospital in a Brazilian city, as well as to describe the time trend of the number of services related to different types of surgery. It is a time-series study that assessed the data from the medical records of patients assisted at a reference hospital in a city in the state of Mato Grosso (Brazil), from 2011 to 2017. The data were assessed using descriptive statistical analysis, correspondence analysis (CA), and time trend analysis. A total of 1488 medical records were evaluated, the majority of which corresponded to male patients (59%), extractions were the most performed procedures (46.2%), local anesthesia was the most applied technique (50.3%), and the procedures were mostly performed in an outpatient environment (53.2%). There was a decreasing global time trend ( $R^2 = 0.248$ ;  $p < 0.001$ ). Male patients are the most assisted in hospital care and are particularly related to more invasive procedures; there is also a decreasing curve of assistance over the years in the oral and maxillofacial surgery and traumatology service of the hospital studied.

**KEYWORDS:** Hospital care. Dental care. Hospital dental team. Epidemiological survey.

## INTRODUCTION

The presence of dentists in the hospital environment is necessary and indispensable (MATTEVI *et al.*, 2011), and it is provided by law (BRASIL, 2012). The number of multi-professional residency programs grows all over Brazil and worldwide, providing the hospital with a cross-sectional view of the patient, in which health is seen as a whole (DA MOTTA; PACHEDO, 2014; MIRANDA, 2017). The importance of dentists in hospital environments is extensively described in the literature, for either the maintenance of an oral environment free from pathogens that may trigger further systemic complications (SOUSA *et al.*, 2014; EPSTEIN, 2014; MIRANDA, 2017) or the early detection and treatment of cysts and tumors in the oral cavity (MORAIS *et al.*, 2006; BRODY *et al.*, 2013).

Among the dental residency programs, the Oral and Maxillofacial Surgery and Traumatology (OMFST) is one of the most traditional. It has an essential role, especially in cases of patients with

systemic conditions that prevent treatment in the outpatient environment (BELL, 2007), as well as every service focusing on diagnosis and the surgical and adjuvant treatment of diseases, traumas, congenital and acquired lesions and anomalies of the masticatory system and auxiliaries, and associated craniofacial structures (BRASIL, 2002; BELL, 2007).

Characterizing the surgical procedures more commonly performed in a given hospital, identifying the months with higher concentration of care services, and investigating time variations may produce useful information for assessing service needs, reorienting care practices, strategic planning, predicting expenditures with personnel and materials, and developing health prevention and promotion programs.

After a critical literature review, it was verified that several studies have focused on characterizing the patients assisted in hospital care and have described the different forms of management (RAPOSO *et al.*, 2011; OLUSANYA *et al.*, 2015; BARBOSA *et al.*, 2017). However,

time-series studies related to this topic are rare. Therefore, this study aimed to characterize the services performed in a Brazilian reference hospital and to describe the time trend of the number of services related to different types of surgery.

## MATERIAL AND METHODS

### Protocol and ethical criteria

All Brazilian and international guidelines related to research ethics involving human beings were respected. The project was approved by an Independent Human Research Ethics Committee (Report #2.097.096 / Certificate of presentation for ethical appreciation: 65676317.1.0000.5165). The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement (Von Elm *et al.*, 2007) was used to aid the research performance and the reporting of results obtained.

### Study design and settings

This was a time-series study of cases assisted in a reference hospital located in a Brazilian capital city. It was cohort for being a longitudinal study that analyzed service rates over time (from February 2011 to February 2017) and historical because it used data contained in the medical records of female and male patients without restriction of age group.

The hospital selected for this study is reference for an estimated population of 585,367 inhabitants living in the city of Cuiabá, which is the capital of the Brazilian state of Mato Grosso. After analyzing the database of the institution, the medical records of the patients were analyzed consecutively.

The cases that were considered significant for the study included services related to biopsies, extractions, implants, management and control of infections, and orthognathic, reconstructive, and trauma surgeries.

### Data collection

Prior to the research, a pilot study and calibration procedures were performed to test the method proposed and standardize the way of interpreting the information available in the medical records of patients. In the pilot study, two researchers were submitted to training and calibration exercises for data collection.

A form was developed specifically for this study from the information contained in the medical records of patients. These records are made by employees of the institution who hold the position of residents. Considering that the institution does not have a digital information system yet, every

record was read and the information matching the objectives of the study were transcribed by the researchers, who were trained and calibrated to fill out the form. A convenience sample was used for data collection as well as the start date is justified by the availability of medical records.

The variables were selected to allow characterizing the services performed in hospital care over the period studied, including: 1) Number of surgical cases assisted; 2) Sex; 3) Classification of procedures (extraction, biopsy, trauma, reconstruction, implant, orthognathic surgery); 4) Location of the procedures (surgery center or outpatient clinic); 5) Type of anesthesia (general, local, local with sedation).

### Data analysis

Initially, a descriptive statistical analysis was performed. Then, Pearson's chi-square test was applied to explore the association among the categorical variables studied (sex of the patient, surgery classifications, location of the procedure, and type of anesthesia used). The significance level was set at 5% ( $p < 0.05$ ). The results of the association between surgery classifications and type of anesthesia used were presented graphically by means of a statistical method that is fairly new, known as correspondence analysis (CA). This technique is rather promising for analyzing data from studies in the field of oral and maxillofacial surgery and traumatology, considering it produces a biplot graphic that allows identifying whether the variables are associated and how the categorical variables are associated, which is not always evident using the traditional statistical methods (HAIR *et al.*, 2009; BERNARDINO *et al.*, 2017).

Lastly, the time trend analysis (MONTGOMERY *et al.*, 2015) was used to evaluate the data by producing polynomial regression models, which aimed particularly to find the curve that best fits the data and to describe the relationship between the number of procedures performed (dependent variable) and the time/month studied (independent variable). This allows identifying whether the number of surgical procedures presented stable, increasing, or decreasing trends during the observation period, which is important for assessing the need for health services, reorientation of care practices, and the reallocation of human and financial resources.

The following polynomial regression models were tested: a) linear; b) quadratic; c) exponential. The selection of the best model was determined by analyzing the scatter plot based on the coefficient of determination ( $R^2$ ), to which the

values closer to 1 indicate better quality of adjustment and residue analysis (assumption of real homoscedasticity). When two models were similar to the statistical point of view, the simpler model (inferior order) was selected to prevent a serial correlation between periods (months) (MONTGOMERY *et al.*, 2015). The IBM SPSS Statistics software (SPSS for Windows, version 20.0, Armonk, NY: IBM Corp.) was used for data analysis, considering a 95% confidence interval.

## RESULTS

During the period studied (from February 2011 to February 2017), 1488 medical records of patients were analyzed. Table 1 shows the

distribution of the cases according to sex, surgery classification, location of the procedure, and type of anesthesia used. Most patients were men (n = 892; 59.9%). According to Table 2, a statistically significant association was verified between the sex of the patient and the type of procedure performed (p < 0.001). The proportion of procedures such as biopsies (n = 226; 51.8%), implant surgery (n = 65; 79.3%), and reconstructive surgery (n = 53; 51.5%) was higher for the group of women, while the proportion of procedures such as extractions (n = 482; 70.2%), management and control of infection (n = 10; 76.9%), trauma (n = 108; 78.3%), and orthognathic surgery (n = 15; 51.7%) was higher for the group of men.

**Table 1.** Distribution of the cases according to sex, surgery classification, location of the procedure, and type of anesthesia used.

Variables	n	%
<b>Sex</b>		
Male	892	59.9
Female	596	40.1
<b>Surgery classification</b>		
Biopsy	436	29.3
Extraction	687	46.2
Implant	82	5.5
Infection	13	0.9
Orthognathic	29	1.9
Reconstructive	103	6.9
Trauma	138	9.3
<b>Location of the procedure</b>		
Outpatient clinic	791	53.2
Surgery center	695	46.8
<b>Type of anesthesia used</b>		
Local anesthesia	749	50.3
Local anesthesia + Sedation	334	22.4
General anesthesia	405	27.2
<b>Total</b>	<b>1488</b>	<b>100.0</b>

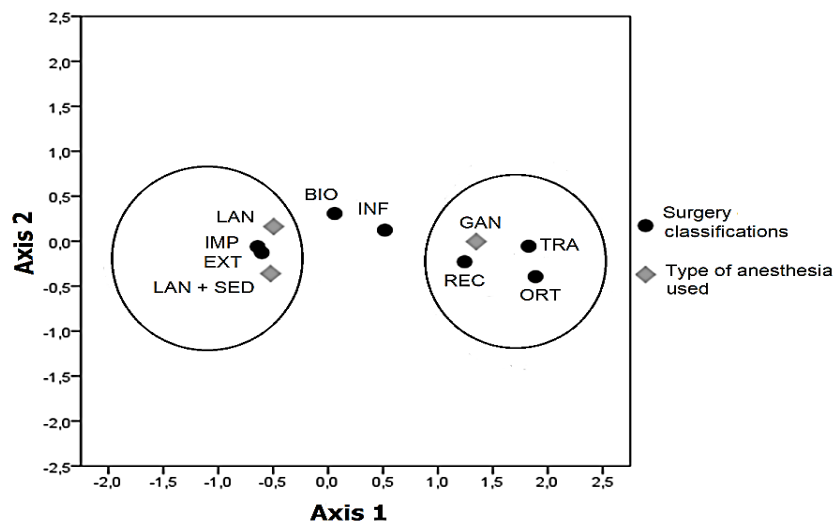
Figure 1 shows the biplot graphic from the correspondence analysis (CA) between the type of surgery performed and the type of anesthesia applied (p < 0.001). A statistically significant association was found (p < 0.001). Local anesthesia or local anesthesia associated with sedation was typically used for procedures such as implant and

extraction, while general anesthesia was applied more often in cases of trauma, orthognathic, and reconstructive surgeries. A heterogeneous pattern of the type of anesthesia used was observed in the cases of biopsy, and management and control of infection

**Table 2.** Association between the sex of the patient and characteristics of the surgical procedures performed.

Variables	Sex		Total n (%)	p-value
	Male n (%)	Female n (%)		
<b>Surgery classification</b>				<b>&lt;0.001*</b>
Biopsy	210 (48.2)	226 (51.8)	436 (100.0)	
Extraction	482 (70.2)	205 (29.8)	687 (100.0)	
Implant	17 (20.7)	65 (79.3)	82 (100.0)	
Infection	10 (76.9)	3 (23.1)	13 (100.0)	
Orthognathic	15 (51.7)	14 (48.3)	29 (100.0)	
Reconstructive	50 (48.5)	53 (51.5)	103 (100.0)	
Trauma	108 (78.3)	30 (21.7)	138 (100.0)	
<b>Location of the procedure</b>				0.067
Outpatient clinic	457 (57.8)	334 (42.2)	791 (100.0)	
Surgery center	434 (62.4)	261 (37.6)	695 (100.0)	
<b>Type of anesthesia used</b>				0.889
Local anesthesia	446 (59.5)	303 (40.5)	749 (100.0)	
Local anesthesia + Sedation	204 (61.1)	130 (38.9)	334 (100.0)	
General anesthesia	242 (59.8)	163 (40.2)	405 (100.0)	

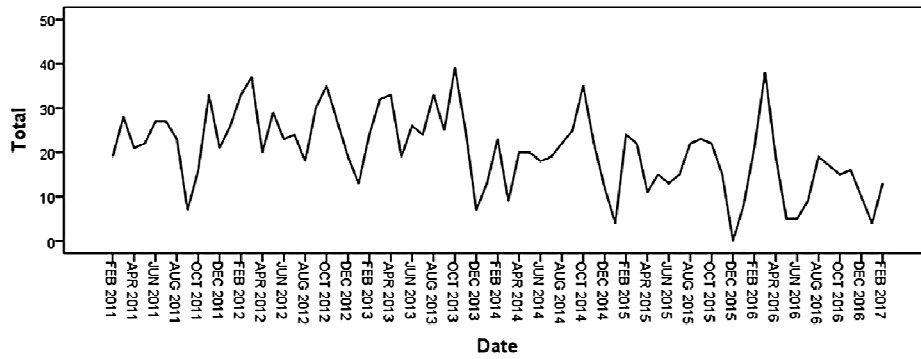
Note. Pearson's chi-square test; \* Statistically significant association at  $p < 0.05$ .



**Figure 1.** Biplot graphic from the correspondence analysis (CA) between the type of surgery performed and the type of anesthesia applied ( $p < 0.001$ ).

Figure 2 presents the time series for the total number of surgical procedures performed from February 2011 to February 2017. According to Table 3, the global time trend was decreasing ( $R^2 = 0.248$ ;  $p < 0.001$ ), meaning that the number of surgeries presented a declining trend. When analyzing the trend according to types of surgeries, a stable trend was found (i.e., without significant variation over time) for the procedures of

orthognathic surgery ( $R^2 = 0.018$ ;  $p = 0.256$ ), trauma ( $R^2 = 0.016$ ;  $p = 0.184$ ), and management and control of infection ( $R^2 = 0.023$ ;  $p = 0.199$ ). A decreasing trend was observed for the other types of procedures. As for implant procedures, the trend was decreasing, but unstable ( $R^2 = 0.292$ ;  $p < 0.001^*$ ), indicating that certain points of the time series showed greater intensification of this type of service.



**Figure 2.** Time series for the total number of surgical procedures performed from February 2011 to February 2017.

**Table 3.** Results of the temporal trend analysis for a series of surgical procedures performed monthly between the years 2011 and 2017.

Variables	Number of cases	Model	R <sup>2</sup>	p-value	Trend
<b>Total</b>	1488	$Y = 22,184 - 0,192 X - 0,004 X^2$	0,248	< 0,001*	Decreasing
<b>Types of surgeries</b>					
Biopsy	436	$Y = 6,567 - 0,045 X - 0,001 X^2$	0,114	0,015*	Decreasing
Extraction	687	$Y = 10,687 - 0,100 X - 0,003 X^2$	0,246	< 0,001*	Decreasing
Implant	82	$Y = 0,766 - 0,036 X + 0,001 X^2$	0,292	< 0,001*	Decreasing, , but unstable
Infection	13	$Y = 0,178 + 0,003 X$	0,023	0,199	Stable
Orthognathic	29	$Y = 0,397 - 0,004 X$	0,018	0,256	Stable
Reconstructive	103	$Y = 1,666 - 0,022 X - 0,001 X^2$	0,170	0,001*	Decreasing
Trauma	138	$Y = 1,890 + 0,011 X$	0,016	0,184	Stable

Note. <sup>(a)</sup> Y = dependent variable (number of procedures performed); X = independent variable (time/month studied); R<sup>2</sup> = coefficient of determination. \* p < 0,05.

**DISCUSSION**

The present study aimed to characterize the services performed in a Brazilian reference hospital and to describe the time trend of the number of services related to different types of surgery. Retrospective studies are crucial and may be useful to reorganize the service team of the hospital according to the demand received besides serving as a basis for planning educational actions. One of the strengths of the present study is to be the first research developed for this purpose in the studied region. The application of the time trend analysis in this scenario also represents a strength once the allows to better explore the database and generates evidence capable of supporting the decision-making process.

Recent data show an increasing presence of oral and maxillofacial surgeons in the hospital environment, especially motivated by the

development of residency programs for training these professionals (ROCHA; FERREIRA, 2014). The role of the oral and maxillofacial surgeon as a dental specialty is very broad, as they are responsible for the management of post-traumatic patients, the performance of biopsies in the oral cavity, excision and resection of tumors, orthognathic surgeries, and management of infections (BRASIL, 2002). This role may be observed in the literature (CUSTÓDIO *et al.*, 2016; VASCONCELOS *et al.*, 2017; VASCONCELOS *et al.*, 2018) and in the results of the present study, in which over one thousand people were assisted by the Oral and Maxillofacial Surgery and Traumatology (OMFST) service of the hospital selected and several types of procedures were performed, thus showing the importance of this specialty in the hospital environment.

Men were most often assisted by the OMFST team in the present study. These data

corroborate other similar studies that show men as the majority in surgical services within hospital environments (OLUSANYA *et al.*, 2015; BARBOSA *et al.*, 2017). It is worth noting that besides representing the majority of services, men are associated with more invasive procedures such as extractions, post-traumatic care, orthognathic surgeries, and treatment of infections, while women are related to procedures such as biopsies and implants. These results confirm the difference in profiles between the sexes observed in other states. For instance, men are always the majority in accidents involving trauma and extractions (OLUSANYA *et al.*, 2015; BARBOSA *et al.*, 2017; VASCONCELOS *et al.*, 2018), while women performed more rehabilitation (THUKRAL *et al.*, 2016) or elective procedures (CAMARGO *et al.*, 2009). Although decreasing over the years, it is concerning that extraction was the most performed procedure. Because of the numerous consequences, extracting a dental unit is only recommended as a last treatment option, but there is still a popular habit of performing extractions as an option for restorative or endodontic procedures (RUSSEL *et al.*, 2013).

In dental outpatient clinics, the use of local anesthesia is safe and extensively promoted, and it may be used in any routine procedure (SU *et al.*, 2014). For special cases of patients with high anxiety levels, the American Dental Association (ADA) has established protocols for decreasing anxiety and pain using sedation (AMERICAN DENTAL ASSOCIATION, 2016). In patients assisted in hospital environments, the more severe clinical condition may motivate more frequent preoperative anxiety conditions, for which the use of sedative agents is required. General anesthesia is another anesthetic mode, which induces the loss of consciousness of the patient and it is used mostly in cases of higher surgical complexity (AMERICAN DENTAL ASSOCIATION, 2016). The results shown in the present study corroborate such definitions, which observed the use of local

anesthesia with or without sedation only in simpler procedures such as extractions, while general anesthesia was used in more complex procedures such as orthognathic, trauma, and reconstructive surgeries.

The heterogeneity regarding the anesthetic mode for procedures such as biopsies and control of infections may be explained by the fact that there are different management forms depending on the clinical condition of the patient (CUSTÓDIO *et al.*, 2016); for instance, more severe infections such as Ludwig's Angina should be treated under general anesthesia (CANDAMOURTY *et al.*, 2012) and other periapical abscesses may be solved using local anesthesia (SIQUEIRA JR; RÔÇAS, 2013). Regardless of the anesthetic technique used, the professionals should always respect the systemic condition of the patient, following the recommendations proposed by the American Society of Anesthesiologists (ASA) (AMERICAN SOCIETY OF ANESTHESIOLOGISTS, 2014).

The present study is observational and therefore its main limitation is not identifying the confounding factors that might be related to the associations found. The present study is observational and therefore its main limitation is not identifying the confounding factors that might be related to the associations found. On the other hand, the present study has contributed to the scientific literature for being the first research to characterize the services of a reference hospital in the city of Cuiabá, Brazil, as well as to use a different statistical analysis with a fairly new and promising method known as correspondence analysis (CA).

## CONCLUSION

Men are the majority in hospital care and they are related to more invasive procedures such as extractions and post-traumatic care. Moreover, a decreasing curve of service was observed over the years in the OMFST of the hospital studied.

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**RESUMO:** O presente estudo teve como objetivo caracterizar os procedimentos realizados pela equipe de cirurgia bucomaxilofacial em um hospital brasileiro de referência de uma cidade brasileira, bem como descrever a tendência temporal da quantidade de atendimentos relacionados a diferentes tipos de cirurgia. Trata-se de um estudo de série temporal que avaliou os dados dos prontuários de pacientes atendidos em um hospital de referência em uma cidade do estado do Mato Grosso (Brasil) entre os anos de 2011 e 2017. Os dados foram avaliados por meio de uma análise estatística descritiva, teste de Análise de correspondência (AC) e análise de tendência temporal. No total, 1488 registros foram avaliados, dos quais a maioria correspondia a pacientes do sexo masculino (59%), exodontias foram os procedimentos mais realizados (46,2%), a técnica anestésica mais empregada foi a local (50,3%) e os procedimentos foram realizados em sua maioria em âmbito ambulatorial (53,2%). A tendência temporal global foi decrescente do tempo global ( $R^2 = 0,248$ ;  $p < 0,001$ ). Os

pacientes do sexo masculino são os mais assistidos no atendimento hospitalar e estão particularmente relacionados a procedimentos mais invasivos; há também uma curva decrescente de assistência ao longo dos anos no serviço de cirurgia oral e bucomaxilofacial do hospital estudado.

**PALAVRAS-CHAVE:** Cuidados hospitalares. Cuidado odontológico. Equipe hospitalar odontológica. Levantamento epidemiológico.

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