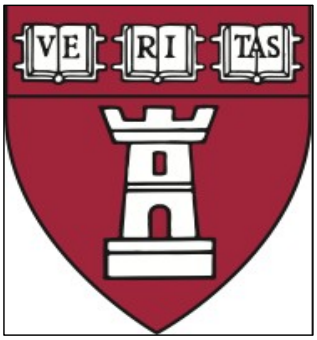
Effectiveness of Three Dental Emergencies Services of Hospitals in Santiago, Chile



“Effectiveness of Three Dental Emergencies Services of Hospitals in Santiago, Chile”.

Thesis Presented by

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Dedicated to my grandparents; Morelia, Nicolas y Susana and my uncles Magda y Ricardo that had accompanied in spirits during all this process.

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Contents

1. Abstract

1.1 Objectives

To compare the effectiveness and patient satisfaction of dental emergencies services of three hospitals in Santiago, Chile.

1.2 Methods

The study design was an uncontrolled before-after study where the intervention was treatment received at the dental emergency service. Participants were interviewed answered a pre- (in-person) and post- (by telephone) surveys. The pre-visit surveys included demographic data, patient's self-reported pain level, and oral health-related quality of life. Self-reported pain level was measured using a Visual Analogue Scale (VAS) and oral health quality of life was measured using the Dental Health Status Quality of Life Questionnaire (DS-QoL); higher values indicated greater pain and lower quality of life. VAS and DS-QoL were measured before and approximately one week after the dental visit. Statistical analysis was performed to test if there was a difference between the effectiveness of the dental emergency services among hospitals using change in the level of pain (VAS scores) and quality of life (DS-QoL) scores.

1.3 Results

A total of 601 patients were interviewed. The average age was 38 years (range 18-85 years) and 57% were females. Across all three hospitals, the most prevalent reason for using dental emergency services was pain (79%). The main diagnoses were periodontal conditions (39%), pulp and periapical lesions (28%), and disorders of tooth eruption (11%). The main treatments given were tooth extraction (71%), antibiotic prescription (12.5%) and other prescriptions (9%).

Eighty percent (n=481) were interviewed at follow-up 7 to 10 days after the initial visit. The median pain scores for pain preceding and following dental care were 70 and 0, respectively. The median quality of life (Ds-QoL) scores preceding and following dental care were 15 and 7, respectively. In univariate analyses, the only factor associated with variation in pain was the patient's chief complaint. In multivariate analyses, chief complaint and hospital were independent predictors of variation on quality of life score.

The median for overall satisfaction was 6, with a maximum of 7. Patient satisfaction was comprised of the median for Interpersonal satisfaction was 30, with a maximum of 35, and the median Technical satisfaction was 20, with a maximum of 20. Using univariate analysis, the factors associated with variation in overall satisfaction were age, type of health insurance, hospital attended, change from baseline in pain level, pain score post-attention, change from baseline in oral health status and type of treatment received. In multivariate analyses, health insurance, pain score post-attention, variation in quality of life and type of treatment received were independent factors of variation on quality of life score.

1.4 Conclusions

The primary driver of dental utilization of emergency departments among adults in three Chilean hospitals was pain. Although most patients had health insurance that covered the cost for emergency, visits their coverage typically did not extend to regular dental care.

The care received by patients at dental emergency services is effective in relieving their dental pain and improving their oral health status. Additionally, the effectiveness of dental care did not vary across the three hospitals included in this study, when measured in change in dental pain, but it does vary across hospital, when measured in change in quality of life.

Although the care received by patients seeking dental emergency services was highly satisfactory, dental care satisfaction varied across the three study hospitals.

2. Chapter 1: Background

2.1 Defining Dental Emergencies

A dental emergency is defined (1) as those patients who present with:

- Severe dental and facial pain not controlled by over-the-counter preparations.
- Dental and soft tissue acute infections.
- Uncontrollable dental hemorrhage following extractions.
- Dental trauma.
- Rapidly increasing facial swelling.

However, dentists and patients may perceive what constitutes a dental emergency differently (2). The dentist might define an emergency as a condition that is causing intractable pain or distress, or one in which general health is threatened. A patient may feel that a painless lost crown is an emergency (2). It is important to consider that emergency visits may be time and culturally dependent, because depending the healthcare available the needs of the people may differ, and as in other services, also dependent on the patient's expectations (3).

In Chile, Hospital Emergency Departments (ED) provide a variety of medical care, some of which is for non-urgent, chronic illnesses including dental conditions (4). Several studies suggest that individuals with limited access to primary care may use the ED for treatment of conditions more appropriately managed in the primary care setting (5, 6). Even in countries with a comprehensive dental insurance system the need for emergency care is not eliminated. It does, however, seem to change the character of chief complaint from swellings, pain and bleeding to patient seeking information and asking questions (3).

Hospital EDs charge close to $1 billion annually to treat these oral conditions, that are the reason for about one percent of ED visitis occurring in U.S.A. each year (7). People who are uninsured and those who reside in low-income areas are likely to seek hospital-based settings for treatable oral conditions (7). Of 39,885,120 hospitalizations that occurred in the U.S., a total of 50,658 (1.27%) were primarily attributed to dental-related conditions. Substantial resources are spent in treating dental-related conditions in hospital settings (8). In the U.S. there are more than 1.3 million emergency department visits resulting in charges of $1 Billion annually due to non-traumatic dental conditions (7). Fodor et al., (9) found that over 40 percent of visits to the Hospital de Urgencia de la Asistencia Pública (HUAP) were due to dental problems. The Department of Statistics of the Chilean Ministry of Health reported that in 2014 there were 17,028,551 visits to the ED to the healthcare center managed by the Chilean government and 2,658,920 (15.61%) were due to dental causes (10). Given the high demand for dental emergency services globally determining the quality and effectiveness of these services is imperative.

2.2 Defining Health Care Quality

Defining health care quality has been examined for decades and the experts still have not formulated a concise, meaningful, and generally applicable definition (11). In 1980, Donabedian (12) defined care of high quality as "that kind of care which is expected to maximize an inclusive measure of patient welfare, after one has taken account of the balance of expected gains and losses that attend the process of care in all its parts". In 1984, the American Medical Association (AMA) defined high-quality care as care "which consistently contributes to the improvement or maintenance of quality and/or duration of life" (13). One of the most widely cited recent definitions of health care quality, and the one that will be used in this study, was formulated by the Institute of Medicine (IOM) in 1990 (14), which says that quality consists of the "degree to which health

services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge".

Quality is a multidimensional concept reflecting the variety of perspectives held by the multiple participants in the health care system. The IOM has defined six domains of health care performance that capture these dimensions (14); safe, patient-centered, timely, effective, efficient and equitable. Maxwell (15) also defined six dimensions, those are; access, effectiveness, equity, acceptability, efficiency and relevance. See Table 1 for a comparison of these two approaches to dimensions of quality.

Table 1: Dimensions of Quality Based on the IOM (14) and Maxwell (15) Approaches.

Dimensions of Quality IOM	Definition	Dimensions of Quality Maxwell	Definition
Safe	Service delivery that is free of accidental injury	----------	----------
Timely	Services that are free from undesirable and unnecessary delays	**Access**	Degree to which people are able to get the service or treatment.
Effective	providing services based on scientific knowledge to all who could benefit and refraining from offering services to those not likely to benefit	**Effectiveness**	Degree to which the service or treatment works.
Equitable	A pattern of care delivery that does not vary by factors unrelated to individual health needs (such as age, gender, race, income, education, location).	**Equity**	Whether those with need can benefit from the service
Patient-centered	Delivery of services in a manner that demonstrates respect for and honors patients' individual preferences and values	**Acceptability**	Patient experience and satisfaction with care received.
Efficient	Services that are delivered without waste of resource inputs.	**Efficiency**	Cost of the service.

----------		**Relevance**	How well a service relates to the need of population.

2.2.1 Effectiveness as a Dimension of Health Care Quality

Effectiveness can be defined as the degree to which the service or treatment works. In the context of emergency services, the principal aim is to relieve symptoms, and for dental emergency services the expectation of the patient is that the service will provide relief of the symptoms as well as a greater certainty regarding the cause of their problem(s) (16). The primary chief complaint of patients attending a dental emergency service is toothache/ pain in the mouth (17-19), so pain relief would be an approach to measure effectiveness of dental emergency services. An accepted pain measure in dentistry is visual analogue scales (20). This method to assess pain is expedient and simple to use for patients before and after attending a dental emergency service.

Alongside with relief of pain dental emergency services also aim to improve oral health. An inexpensive form of measuring improvement of oral health is measuring perceived oral health quality of life or impact before and after the visit to the dental emergency service. There are many oral health qualities of life measures; one of the more established measures is the oral health impact profile (OHIP) (21), however this has been judged to be either too long or otherwise inappropriate for measuring short-term changes in patients' perceptions with acute dental problems (17). A less used oral health quality of life measure is the Dental Health Status Quality of Life Questionnaire (DS-QoL) (22). The DS-QoL instrument captures the patient's focal pain and functional/social dimensions of quality of life that acute dental problems are known to impact and has been used by Anderson (17) in measuring effectiveness of dental emergency services.

2.2.2 Patient Satisfaction as a Dimension of Health Care Quality

Patient satisfaction is not a clearly defined concept, although it typically appears to represent patients' attitudes to care or aspects of the care they received (23). Satisfaction is a multidimensional concept such that there is no single, easily understood definition that would apply to all patients (24). Patient satisfaction is determined by the expectation of the patient, patient characteristics and psychosocial determinants (25). The components of patient satisfaction are (25); 1) interpersonal manner, 2) technical quality, 3) accessibility or convenience, 4) finances, 5) efficacy or outcomes, 6) continuity, 7) physical environment and 8) availability.

There are several patient satisfaction measures which have been developed in relation to dental care; the dental satisfaction questionnaire (DSQ) (26), the dental visit satisfaction scale (DVSS) (27) and the dental consumer quality assessment instrument (DCQA) (28), this instruments are developed to measure patient satisfaction with scheduled dental appointments. Another measurement of patient satisfaction is the patient experience questionnaire (PEQ) (29), this included modified questions from the DVSS, but it is not focus to schedule appointments, so it can be used for the context of a visit to dental emergency; that is a single visit. Additionally, PEQ has been used to measure patient satisfaction with dental emergency services (29).

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3. Chapter 2: Specific Aims

Oral health is an integral element of general health and well-being. Good oral health enables individuals to communicate effectively, to eat and enjoy a variety of foods, and is important in the overall quality of life, self-esteem and social confidence (1). However, oral diseases affect a significant proportion of the world's population and exact a heavy toll in terms of morbidity and mortality (2). Oral diseases are highly prevalent and their impact on both society and the individual is significant. Pain, discomfort, sleepless nights, limitation in eating functions leading to poor nutrition, and time off school or work as a result of dental problems are all common effects of oral diseases (3).

Although overall improvements in oral health have occurred in many developed countries over the last 30 years, oral health inequalities have emerged as a major public health challenge because lower income and socially disadvantaged groups experience disproportionately high levels of oral disease. Dental caries is still a major oral health problem in most industrialized countries, affecting 60- 90% of schoolchildren and the vast majority of adults (2).

In Chile, in the year 1999 the National Dental Health Care system assisted 1,053,037 persons, and in the year 2000 the dental emergency attentions were 1,587,655, an increment of 51% in comparison to the previous year (4). Given the high number of patients treated for emergency dental services, it is relevant to know more about the attention in these services.

The purpose of this study is to determine the effectiveness and patient satisfaction the users of the dental emergency services of three hospitals in Santiago, Chile.

- ***Specific Aim 1:*** Describe the demographic and clinical characteristics of the population that access to dental emergency services in three hospitals in Santiago, Chile.
- ***Specific Aim 2:*** Determine whether the care received by patients of dental emergency services is effective in relieving their dental pain or improving their oral health status and test the hypothesis that the effectiveness of dental care does not vary across the three hospitals included in this study.
- ***Specific Aim 3:*** Establish patient satisfaction with the care received at the emergency services in three hospitals in Santiago, Chile, and test the hypothesis that patient satisfaction with dental care does not vary across the three hospitals included in this study.

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4. Chapter 3: Utilization of Dental Emergency Services

4.1 Abstract

Objective: To describe the demographic and clinical characteristics of the patient population that uses dental emergency services in three hospitals in Santiago, Chile.

Methods: The study design was an uncontrolled before-after study; intervention was treatment at the dental emergency service. Patients seeking dental emergency services at one of three hospitals in Santiago, Chile were interviewed before and after receiving treatment. Patients completed interviewer administered surveys which asked about patients' self-reported pain, oral health-related quality of life and demographic data. Demographic information collected included age, sex, educational level, type of health insurance, citizenship and municipal district where patients lived and worked. Additionally, patient's clinical information was collected from the clinical record; a member of the research team collected information describing each patient's clinical diagnosis and the treatment. Descriptive analyses were performed.

Results: A total of 601 patients were interviewed at the time of their dental emergency. The average age was 38 years (range 18-85 years) and 57% were females. Of the patients that attended the dental emergency services 90% had some type of health insurance. Across all three hospitals, the most prevalent reason for using dental emergency services was pain (79%). The main diagnoses were periodontal conditions (39%), pulp and periapical lesions (28%), and disorders of tooth eruption (11%). The main treatments given were tooth extraction (71%), antibiotic prescription (12%) and other prescriptions (9%).

Conclusion: The primary driver of dental utilization of emergency departments among adults in three Chilean hospitals was pain. Although most patients had health insurance that covered the cost for emergency, visits their coverage typically did not extend to regular dental care.

4.2 Introduction

Dental Emergency

Hospital Emergency Departments (ED) provide a variety of medical care, some of which is for non-urgent, chronic illnesses including dental conditions (1). Several studies suggest that individuals with limited access to primary care may use the ED for treatment of conditions more appropriately managed in the primary care setting (2, 3).

Oral conditions comprise approximately one percent of all ED visits occurring in the United States each year, with costs of close to one billion dollars annually. People who are uninsured and those who reside in low-income areas are likely to seek hospital-based settings for oral conditions (4). Substantial resources are spent in treating dental-related conditions in hospital settings (5). In the U.S. there are more than 1.3 million emergency department visits with one billion in annual costs due to non-traumatic dental conditions (6).

Dental emergency care systems have been the subject of research in several countries. Studies have been carried out to understand various aspects concerning these services, including: population demand for access to emergency dental care (7), use patterns (8), and provision beyond normal working hours (9). The patterns of provision for dental emergency vary widely between and within countries. For example, there is geographical variation in the "out-of-hours" dental services provided in the United Kingdom (9). This also changes according to time; there are differences between what kinds of services are available on weekdays after work hours and on weekends (9).

In Chile, oral health problems are similar to those in the rest of the world. Although 83% of 2-year-old children in Chile are cavity-free, the prevalence of caries experience increases dramatically with age, and the damaging outcome of caries increases (10-14). The prevalence of caries experience of adults ages 35- 44 and 65- 74 years is 98% (13).

Chile has a National Health Care System that includes dental services in community health centers, specialty centers, hospitals and emergency services (15). Today in Chile, access to routine dental care services is available only for age-specific members of the population: children aged 2 years, 4 years, 6 years, and 12 years, as well as adults at age 60 and all pregnant women (16). These restrictions produce a sizable gap between the coverage and need for treatment particularly among low-income individuals. For this reason, the majority of the Chilean population resorts to the emergency dental services units to obtain dental treatment [4]. Furthermore, because most of the population can access dental care only through the emergency dental services, it is important to ascertain the quality and results of care from these services. Since the Health Goals for Chile in the 2000-2010 period (17) consider the provision of services appropriate to the public's expectations and incorporate the need to measure levels of satisfaction of such expectations, it follows that we must ascertain not only the needs and use patterns of existing dental emergency services, but also patient satisfaction with those services. In recent years, patient-centered outcomes, including patient satisfaction have gained attention in health services research as important markers of health care delivery effectiveness. (18, 19). For example, existing studies in England have examined pain relief, gains in oral health, and the expectations and satisfaction of patients on their impact of effectiveness of after-hours dental emergency services (20-22). Patient's

perception of the effectiveness in their dental emergency care has also been a measure in quality of service given by the dentist (23, 24).

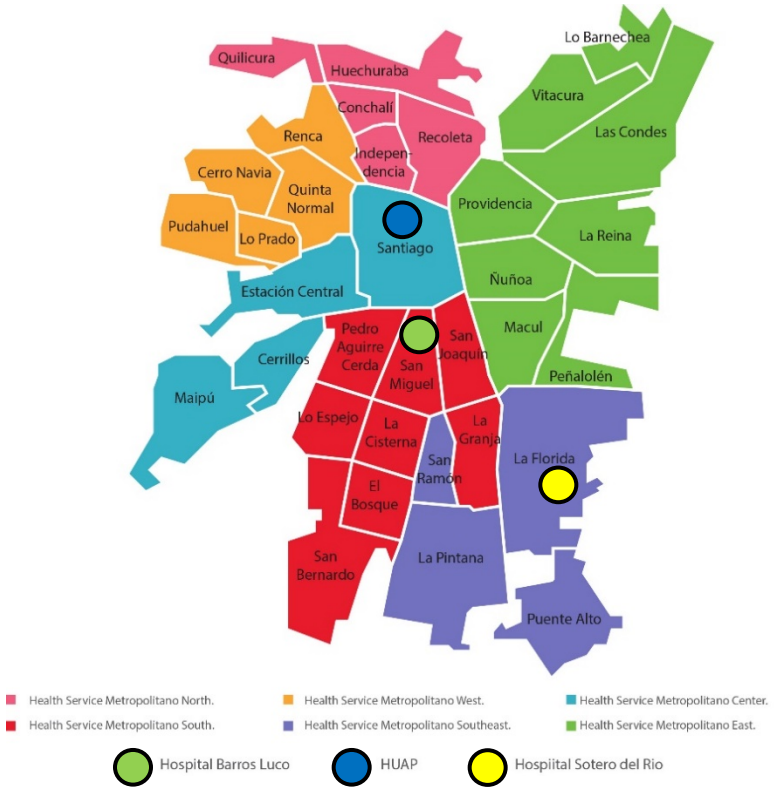
The overall purpose of this study was to describe the distribution and characteristics of the users and the effectiveness of the care they received from the dental emergency services of three hospitals in Santiago, Chile and their effectiveness. The three hospitals that offer 24/7 dental emergency services were selected; this was a purposive sample of hospitals. The aim of this first paper was to describe the demographic and clinical characteristics of the population that utilizes dental emergency services in the three hospitals.

4.3 Methods

Design: The study design was an uncontrolled before-after study; intervention was the treatment given by the dental attending at the dental emergency service.

Hospital selection: A purposive sampling strategy was used for hospital selection. Almost one-third of the country's population live in Santiago, the capital of Chile, or approximately 6 million inhabitants. In 2007 there were six hospitals that had dental emergency services that operated on a 24/7 basis (25) in Santiago. Of those six, one was a pediatric hospital, which was excluded from this study, and another no longer provided dental emergency services. Of the remaining four, the three hospitals with greater numbers of dental emergencies were selected (Figure 1).

Figure 1: **The location of the three selected hospitals in Santiago, Chile.**



Study Participants: The study population included individuals who sought oral health-related care at one of the three hospital's Emergency Departments (ED).

Data collection: All patients who were waiting in the dental emergency services were approached to participate in the study during weekday work hours between April - November, 2018. A trained interviewer briefly explained the study, including eligibility criteria, and asked if the patient would be willing to participate. If the patient agreed to participate, they were taken to a private room where the interviewer went over the informed consent paperwork. After the consent form was signed, the patient completed an interviewer-administered survey. Additionally, patient's clinical information was collected from the clinical record; a member of the research team collected

information describing each patient's clinical diagnosis and the treatment. ***Note:*** Only two of the three hospitals provided the dentists' clinical diagnosis and treatment due to staff availability.

Inclusion/ Exclusion Criteria:

Inclusion criteria: Individuals who 1) received dental emergency care at one of the selected hospitals during the recruitment period, 2) were age ≥18 years, 3) were able to provide informed consent and verbally respond to the study questionnaires, and 4) indicated that they would be available for the phone follow-up.

Exclusion criteria: Individuals who were under the age of 18 and were unable to provide informed consent or a reliable account of information due to psychiatric or cognitive disorders, and any underlying factors that prevented voluntary participation, as determined by a next of kin or health care professional at the emergency services department.

Ethical Considerations: The Harvard Longwood Medical Area Institutional Review Board (IRB) determined this study to be exempt (IRB17-1477). The study was also reviewed and approved by each of the Institutional Review Boards of the three hospitals included in the study.

Questionnaires: Participants were interviewed in the waiting room before seeing the dentist. The interviewer-administered surveys included demographic data, patient's score of their pain, and patient's score of oral health-related quality of life. The *surveys* (Appendix 1) included demographic data, patient's self-reported pain level, and patient's self-reported oral health-related quality of life. Demographic information collected included age, sex, educational level, type of health insurance, citizenship and municipal district where they lived and worked. Patient-reported level of pain was measured using a Visual Analogue Scale (VAS), which ranges from 0 to 100, with 0 indicative of feeling no pain and 100 feeling the worst pain imaginable. Patient-reported oral health-related quality of life was assessed using the Dental Health Status Quality of Life

Questionnaire (DS-QoL), which ranges from 6 to 18, where 6 was the best quality of life and 18 the worst quality of life possible (26, 27). The *dentist form* was filled by a member of the research team (Appendix 3) and included clinical diagnosis and treatment given to the patient.

Definitions and Measures: The questionnaire was subdivided into three main sections: 1) Demographic and clinical information, 2) Pain experience and, 3) Patient satisfaction. Results from section 2 and 3 are discussed in chapters four and five. This chapter primarily focuses on section 1 (demographic and clinical characteristics).

Variable Description: Variables are described in Table 1.

Table 1: Variables definition, type and category.

Name	Definition	Data Type	Category
Hospital	Institutions with an organized medical staff which provide medical care to patients.	Nominal	Barros Luco
			HUAP
			Sotero del Rio
Age	The length of time during which a being has existed; measured in years.	Discrete	In years
Sex	The totality of characteristics of reproductive structure, functions, PHENOTYPE, and GENOTYPE, differentiating the MALE from the FEMALE organism.	Nominal	Female
			Male
Educational status	Educational attainment or level of education of individuals.	Nominal	Elementary School
			High School
			Trade School
			College
Health Insurance	Socio-economic status, according to the type of health insurance.	Nominal	FONASA A
			FONASA B
			FONASA C
			FONASA D
			ISAPRE
			Other
Country of Origin		Nominal	Chilean
			Other
Home address	Municipal district of the home address.	Nominal	Santiago Centro
			San Miguel
			Puente Alto
			Other
			No Answer
Work address	Municipal district of the work address.	Nominal	Santiago Centro
			San Miguel
			Puente Alto

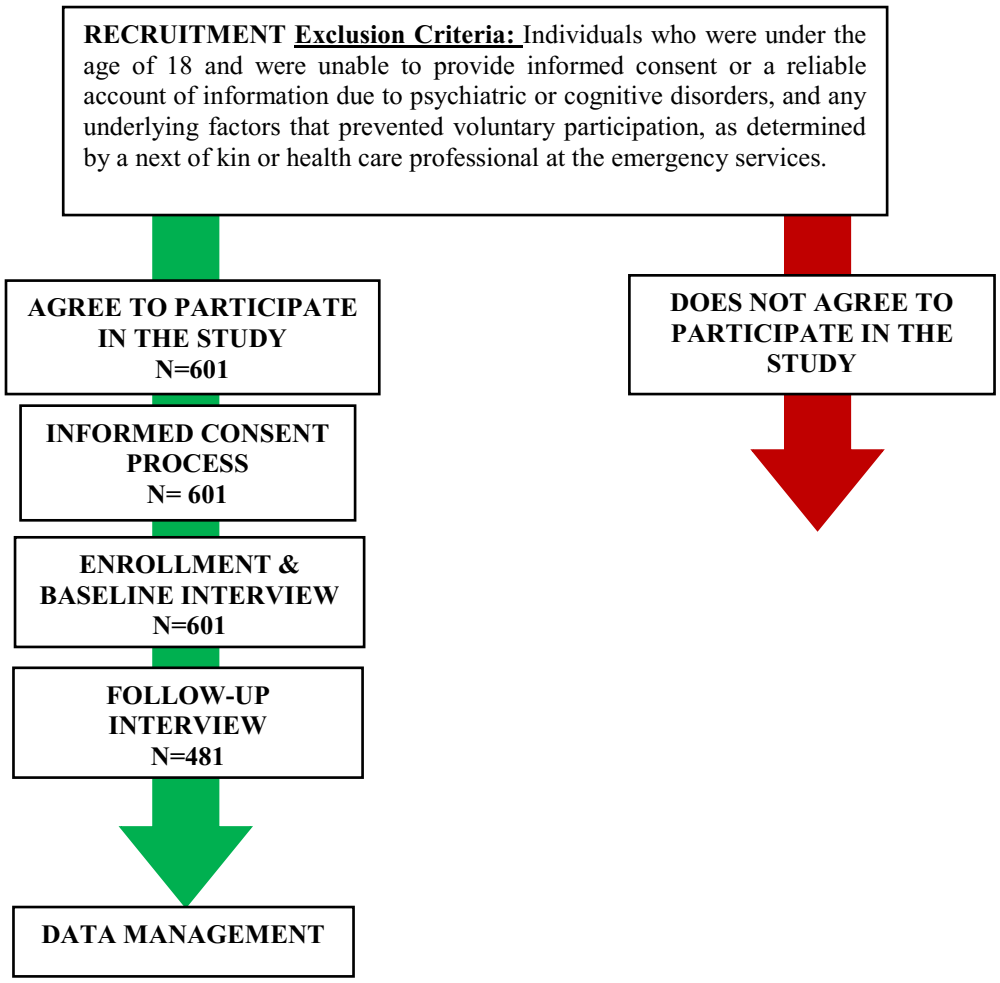
			Other
			No Answer
Chief complaint	The primary symptom that a patient states as the reason for seeking dental care.	Nominal	Toothache or pain in mouth
			Loss of filling or crown
			Dento-alveolar trauma
			Swelling in the mouth
			Other
Diagnosis	Determination of the nature of a disease or condition made by a dentist.	Nominal	Pulp and Perical lesions
			Gingival and Periodontal conditions
			Mouth celulitis or abcess
			Disorders of teeth eruption
			Dental Trauma, tooth fracture or radicular rest
			Complication of tooth extraction
			Other
Treatment	Procedures concerned with the care provided.	Nominal	Antibiotic prescription
			Other prescription
			Tooth extraction
			Other

Chilean health insurance is a two-tiered system. It includes public insurance, which covers 76% of the population and is funded through a public agency, Fondo Nacional de Salud (FONASA), and private insurance (ISAPREs), which covers 19% of the population (28). The public insurance, FONASA, divides beneficiaries into four groups depending on monthly salary (Table 2)(29).

Table 2: Chilean Public insurance (FONASA) by section (29).

Section	Beneficiaries of the Section
FONASA A	Beneficiaries lacking resources to pay contributions in health, or in conditions of indigence (non-contributors).
FONASA B	Beneficiaries with incomes less than U$ 450 per month (contributors) Workers in the public health sector
FONASA C	Beneficiaries with incomes between U$ 450 and $655 per month (contributors)
FONASA D	Beneficiaries with income of U$ 656 and more per month (contributors)

Figure 2: **Participant Recruitment and Data Collection Process.**



Sample Size: To calculate the optimal sample size needed for this study, effect size was established from the data collected through a pilot study. The effect size for the level of pain was 10 points with a standard deviation of 30, and the effect size for quality of life was 25 with a standard deviation of 100. With a power of 80%, the *n* for the level of pain was 73 and 128 for quality of life. Given that the *n* for quality of life was bigger, that value was used for the final sample size estimate. The expected loss to follow-up was 15%, resulting in a calculated total of 150 patients needing to be interviewed in each hospital and a total of 450 patients enrolled in the study. The study enrolled and interviewed 601 patients, 200 from each hospital.

Data Management and Analysis: Data were collected during the in-person interview and during chart abstraction (into the dentist questionnaire) by using paper forms. All paper documentation was given an ID number per patient and all patient identifiers removed prior to subsequent analysis. Paper documentation was scanned and electronically stored in a password-protected file. Data were entered into a secure database and stored in a password-protected file in the cloud.

All statistical analyses were performed using STATA 14. Descriptive statistics for the demographic and clinical characteristics of the participants were calculated for each hospital. The demographic variables included age, gender, country of origin, level of study, type of health insurance and municipal district lived and worked in. The clinical variables included clinical diagnosis, treatment and type of emergency. Clinical diagnostic categories were created according to Allareddy (5, 30): diseases of the pulp and periapical tissues, gingival and periodontal conditions, mouth cellulitis or abscess, disorders of teeth development and eruption, dentoalveolar trauma, complication of tooth extraction and others.

4.4 Results

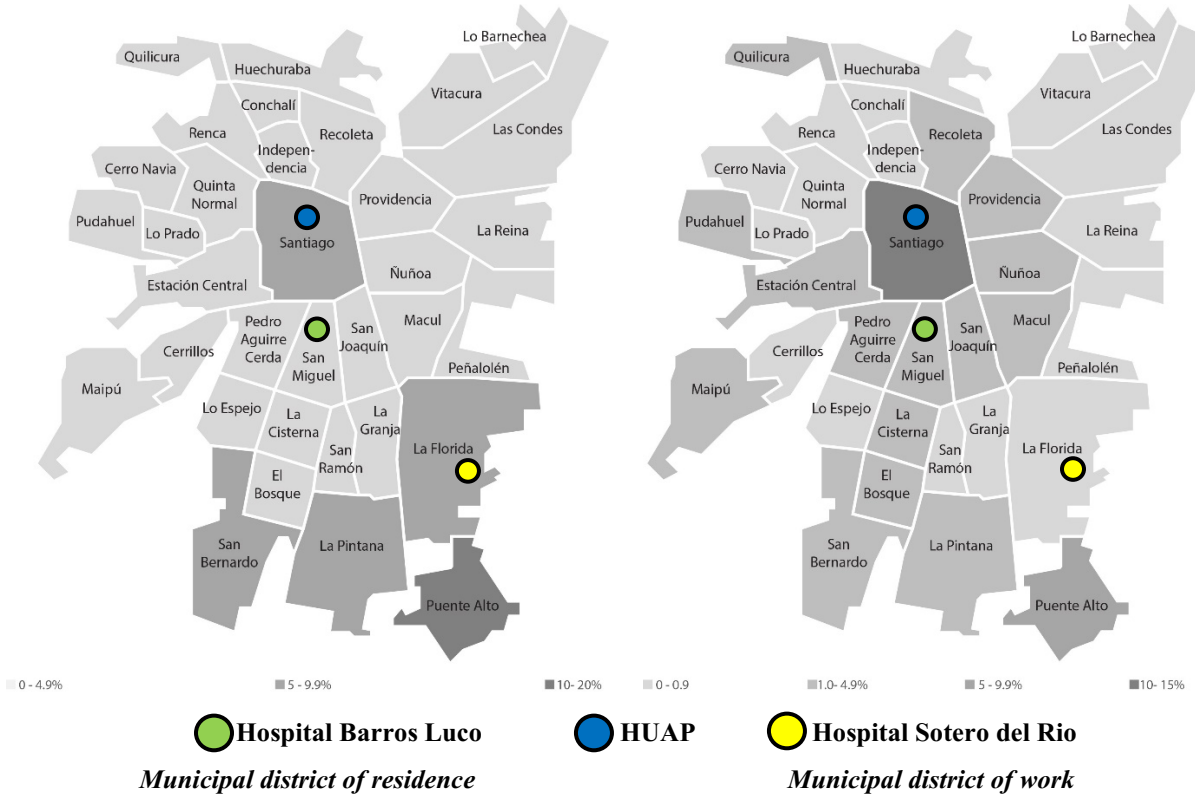
In this study 601 people participated. Of the people that participated (refer to Table 3), 182 people went to Hospital Barros Luco, 237 went to Hospital de Urgencia Asistencia Publica (HUAP) and 182 went to Hospital Sotero del Rio. The average age was 38 years (range 18-85 years), and more than half were females. Almost half of the participants had a high school education followed by those with a trade school school education. A quarter of all the participants were covered by the health insurance FONASA D, however distribution of coverage differed by hospital. The majority of the participants across the hospital sites were Chilean nationals.

Table 3: Demographic characteristics of all the study participants (N= 601) by hospital.

VARIABLE	Category	Total Sample		Hospital Barros Luco		HUAP		Hospital Sotero del Rio	
Age	Mean	38		38		37		39	
	S.D.	14.24		14.38		12.99		15.57	
	Minimum	18		18		18		18	
	Maximum	85		85		81		78	
		N	%	n	%	n	%	n	%
Sex	Female	343	57	101	56	135	57	107	59
	Male	258	43	81	44	102	43	75	41
Educational Level	Elementary School	85	15	24	13	23	10	38	21
	High School	291	49	95	53	117	50	79	45
	Trade School	131	22	29	16	60	26	42	24
	College	83	14	33	18	33	14	17	10
Health Insurance	FONASA A	136	23	57	33	37	15	43	24
	FONASA B	129	22	35	20	48	20	48	26
	FONASA C	104	18	27	15	45	19	32	18
	FONASA D	147	25	32	18	75	32	40	22
	ISAPRE	13	2	4	2	4	2	5	3
	Other	62	10	21	12	28	12	13	7
Citizenship	Chilean	545	91	172	95	199	84	174	97
	Other	55	9	10	5	38	16	7	3
Municipal District of residence	Santiago Centro	431	72	7	3	45	19	1	0.5
	San Miguel	53	9	16	9	0	0	0	0
	Puente Alto	16	2	3	2	1	0.5	92	51
	Other	96	16	156	86	187	79	88	48
	No Answer	5	1	0	0	4	1.5	1	0.5
Municipal District of work	Santiago Centro	78	42	22	12	40	17	16	9
	San Miguel	13	13	13	7	0	0	0	0
	Puente Alto	32	2	0	0	0	0	32	17
	Other	250	5	95	52	84	35	71	39
	No Answer	228	38	52	29	113	48	63	35

The distribution of the total sample by municipal district of residence or work show that people from all the municipals district of Santiago city attended the dental emergency services of the hospitals included in this study (Figure 2).

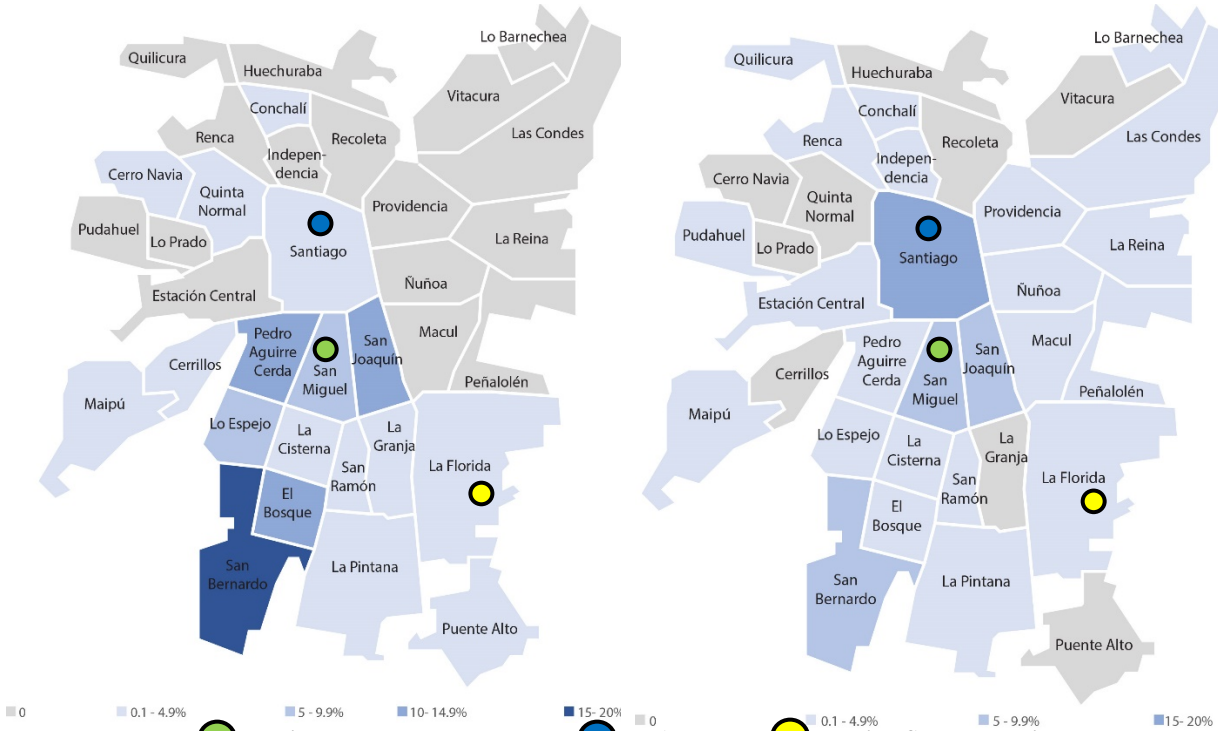
Figure 2: Distribution of study participants by municipal district of residence and municipal district of work



In the distribution by hospital we can see that most of the people that attended each hospital either live or work in the municipal districts close to them (Figure 3). However, HUAP had people all over Santiago city attending to their dental emergency.

Figure 3: Distribution of study participants by municipal district of residence and municipal district of work by Hospital

HOSPITAL BARROS LUCO



Hospital Barros Luco

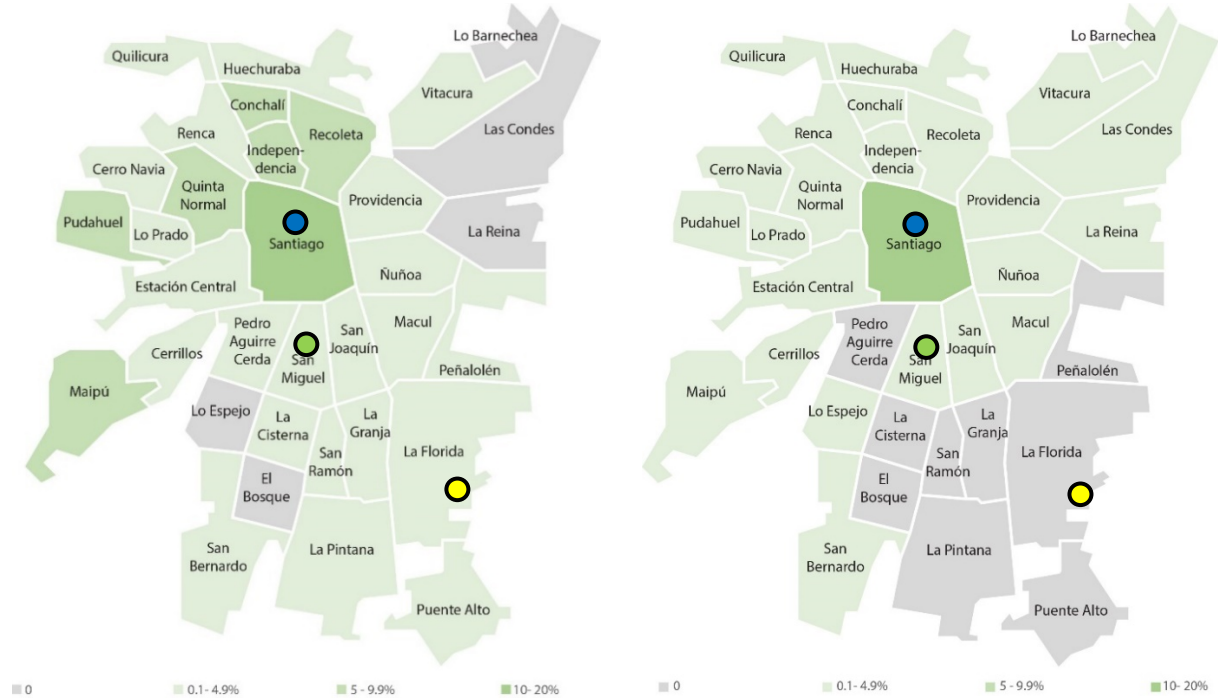
Municipal district of residence

HUAP

Hospital Sotero del Rio

Municipal district of work

HUAP



Hospital Barros Luco

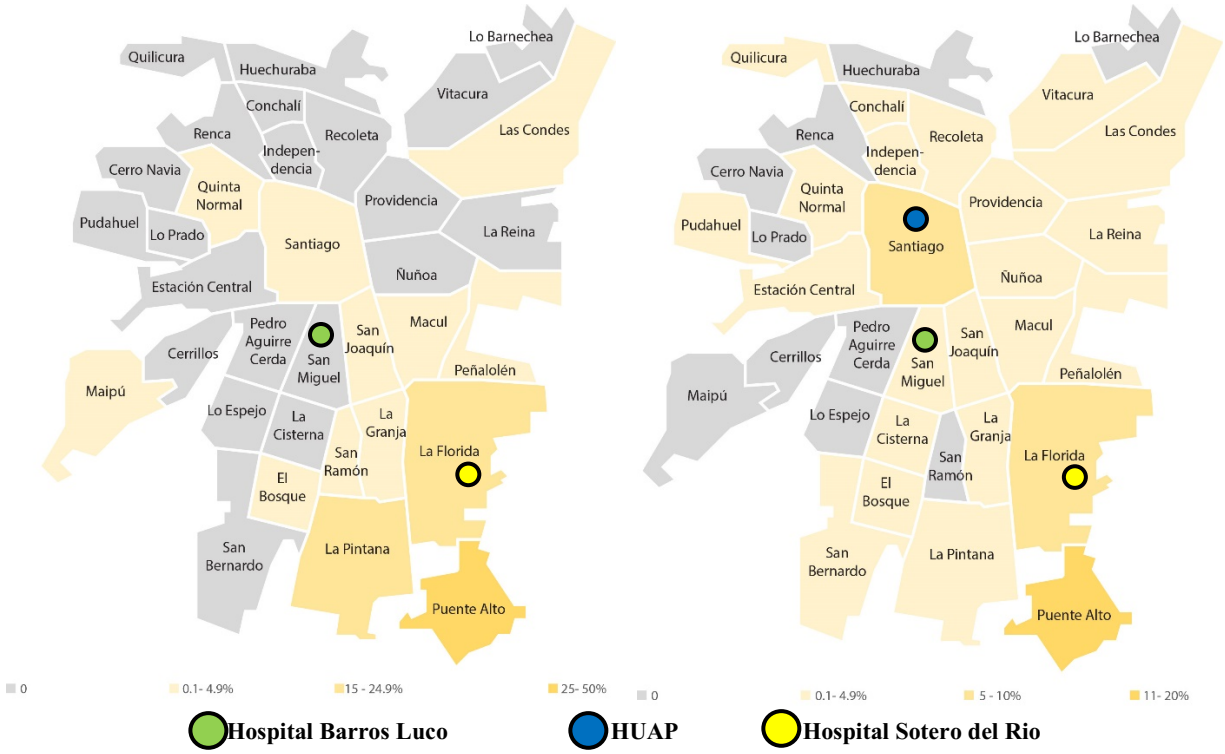
Municipal district of residence

HUAP

Hospital Sotero del Rio

Municipal district of work

HOSPITAL SOTERO DEL RIO

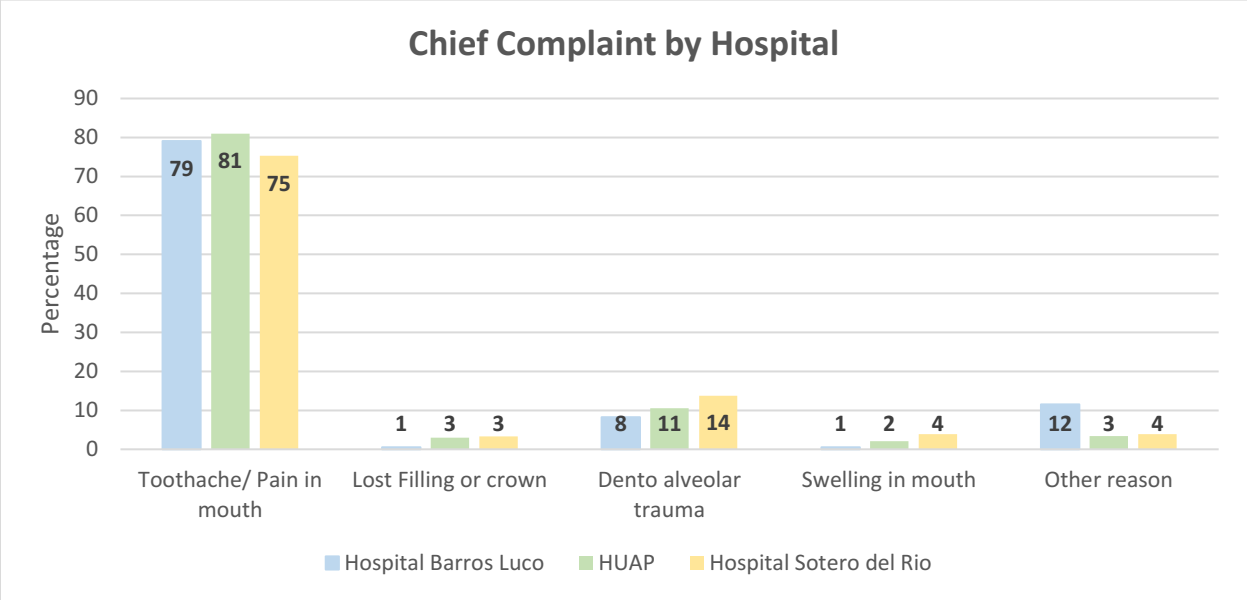


Municipal district of residence

Municipal district of work

Across all three hospitals, participants' main chief complaint was toothache/ pain in the mouth (79%), followed by dento-alveolar trauma (11%). Toothache/pain in the mouth was reported by the majority of participants as their chief complaint in each of the three hospitals (Figure 4). Few patients reported visiting the ED for lost prior restorative work or swelling in the mouth.

Figure 4: Percent of study participants' chief complaint by hospital



Overall, the most recurrent diagnosis was pulp and periapical lesions and gingival and periodontal conditions, however, each hospital differed in the majority diagnosis (Table 4). Almost three-quarters of cases were resolved with extraction, a proportion that did not differ appreciably by hospital. One hospital provided almost 30% of the study participants with prescriptions; less than half of the participants received prescriptions for antibiotics.

Table 4: Clinical diagnosis and treatment received for all study participants (N=417) and by hospital*.

	Category	Total Sample		HUAP		Hospital Sotero del Rio	
		N	%	n	%	n	%
Diagnosis of chief complaint	Pulp and Periapical lesions	118	28	108	45	10	6
	Gingival and Periodontal conditions	162	39	38	16	124	69
	Mouth cellulitis or abscess	26	6	18	8	8	4
	Disorders of teeth eruption	43	11	29	12	14	8
	TDA or Tooth fracture or RR	18	4	9	4	9	5

	Complication of tooth extraction	13	3	5	2	8	4
	Other	37	9	30	13	7	4
Treatment provided	Other	31	8	24	10	7	4
	Antibiotic prescription	38	9	26	11	12	7
	Other prescription	51	12	11	5	40	22
	Tooth extraction	296	71	176	74	120	67

Note: The clinical characteristics from Hospital Barros Luco were not available because the dentist questionnaire could not be collected at this hospital.

The main diagnosis was gingival and periodontal conditions (39%), followed by pulp and periapical lesions (28%) and disorders of teeth eruption (11%) for the total sample. HUAP had as the main diagnosis pulp and periapical lesions (45%), gingival and periodontal conditions (16%) and other (13%) and Hospital Sotero del Rio gingival and periodontal conditions (69%), disorders of teeth eruption (8%) and pulp and periapical lesions (6%). The main treatment provided was tooth extraction (71%), followed by other prescription (12%) and antibiotic prescription (9%).

4.5 Discussion

The purpose of this paper was to describe the demographic and clinical characteristics of the population that uses dental emergency services in three hospitals in Santiago, Chile.

Overall, the mean age of the study participants who attended the dental emergency services was 38 years old and 38, 37 and 39 years for Hospital Barros Luco, HUAP and Hospital Sotero del Rio respectively. This was slightly higher than the study from Allareddy and others (4) in which mean age was 33 years for attendance to dental emergency in the U.S. Two studies conducted in Chile reported the highest percentage of attendance was 20-50 year-olds (31) and 20-60 year-olds (32), a study from England reported 25- 44 year-olds (22) and a study from Canada 20-44 year-olds (33). It is difficult to compare our result from different studies because most studies use different

thresholds to categorize age. However, most studies show that the patients who utilized dental emergency were adults. In this study, this can be attributed to the Chilean Government policy in which children have access and coverage to routine dental care but most adults do not (16).

Overall, slightly more than half of the study participants were females. All three hospitals included in the study had a slightly higher percentage of females attending dental emergency services which was also observed in studies conducted in the U.S. (4), Canada (33), France (34) and another study from Chile (32). Two studies from England (22, 35) and another from Chile (31) showed a higher percentage of males. Nonetheless, in general differences in sex distribution have been small, which suggests that attendance to emergency services are not determined by sex. This is a much smaller differences than have been noted for routine health care services, where women have higher utilization (36).

The distribution of the total sample according to educational level, from highest to lowest percentage, was high school, trade school, elementary school and college. The three hospitals had the highest percentage of attendance from people with a high school education, which is similar to another study from Chile (32). However, the distribution of the other educational levels varied across the hospitals.

A study done in HUAP 2005 (31) showed that more patients with FONASA A and B utilized services which is in contrast with the current study where more patients with FONASA D were the ones who utilized the services.

Most of the people attending dental emergency services where Chilean and the minority, less than ten percent, where from other citizenship. Hospitals Barros Luco and Sotero del Rio had a low rate of people from other countries attending to dental emergencies, 5 and 3 percent respectively.

HUAP had 16% of people from other countries attending to dental emergencies, which is expected since the municipal district where HUAP is located is the municipal district with the second highest immigrant population in the country (37).

The main chief complaint in this study was toothache/ pain in the mouth, which is similar to other studies about dental emergency in England (22), UK (35), and Chile (32). One study from Sweden (38) had pain as the third reason to utilize dental emergency services. Emergency visits for dental treatment are common in all countries, but the primary driver for the visit is not consistently the same and may vary according to the type of coverage and access to routine dental care of each country.

The main diagnosis for the patient complaint was gingival and periodontal conditions, followed by pulp and periapical lesions and disorders of teeth eruption for the total sample. Studies from other countries listed as main diagnoses dental caries, pulp lesions and gingival diseases (30), pulp lesions, others and stomatitis (33), oral trauma (34), caries and periodontal diseases (31), material fracture, tooth fracture and dental traumas (38) and caries, cavities or loss of restoration and acute periapical periodontitis (35). Most studies showed caries and their complications and gingival and periodontal diseases as main diagnoses for visits to dental emergency services. However, is difficult to compare across or between studies due to the lack of standardized diagnostic terminology in dentistry (39).

The primary treatments given were tooth extraction (71%), antibiotic prescription (12.5%) and other prescription (9%). There have been only two other reports that described treatments provided: one from England (35) listed the primary treatments as antibiotic prescriptions, dressing and extraction; and another study from Chile (32) reported extractions, prescriptions and referrals as the primary treatments. It appears that the most common treatments provided to individuals with

dental emergencies are extractions and prescriptions. It is possible that the hospitals included in this study are not equipped to perform restorations.

It is possible, and in fact likely, that we underestimated the burden associated with dental-care–related emergency visits that occur across various types of health care settings in Santiago. This is because we included only three of four possible hospitals, collected data only on weekdays between 8 am and 8 pm, and included only patients who agreed to participate. People that seek care in other hospitals, dental clinics or community health centers were not included in this study. A limitation of this study was that the clinical data was available only for two of the three hospitals, so the data about diagnosis of chief complaint and treatment provided do not represent the total sample. Another limitation of this study was that other oral health factors such as oral hygiene behaviors and regular access to a dentist related to emergency visits were not collected, so it was not possible identify possible risk factors or simple indicators. With respect to access, the greatest need for emergency dental services reportedly occurs on weekends and public holidays (7), so in the future, it may be useful to compare the weekday activity inside the emergency dental department, with that during weekends and public holidays, and evaluate the types of treatments needed during the different time periods.

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5. Chapter 4: Effectiveness of Dental Emergency Services

5.1 Abstract

Objective: To determine whether the care received by patients of dental emergency services in three hospitals in Santiago, Chile is effective in relieving their dental pain and/or improving their oral health status.

Methods: The study design was an uncontrolled before-after study where the intervention was treatment received at the dental emergency service. Patients seeking dental emergency services at one of three hospitals in Santiago, Chile were interviewed before and after receiving treatment. Patients completed interviewer administered surveys which asked about patient's self-reported pain level, oral health-related quality of life, and demographic information. Self-reported pain level was measured using a Visual Analogue Scale (VAS) and oral health quality of life was measured using the Dental Health Status Quality of Life Questionnaire (DS-QoL); higher values indicated greater pain and lower quality of life. VAS and DS-QoL were measured before and approximately one week after the dental visit. Demographic information collected included age, sex, educational level, type of health insurance, citizenship and municipal district where patients lived and worked. Statistical analyses were performed to test if there was a difference between the effectiveness of the dental emergency services among hospitals using change in the level of pain (VAS scores) and quality of life (DS-QoL) scores. Linear regression was used to identify variables associated with the effectiveness of the dental emergency services.

Results: A total of 601 patients across the three hospitals in Santiago, Chile were recruited and interviewed before receiving emergency dental care. Eighty percent (n=481) were interviewed at follow-up (7 to 10 days after the initial visit). The median pain scores for pain preceding and following dental care were 70 and 0, respectively. The median DS-QoL scores preceding and

following dental care were 15 and 7, respectively. In univariate analyses, the only factor associated with change from baseline in pain level was the patient's chief complaint. In multivariate analyses, chief complaint and hospital were independent predictors of change from baseline in oral health status.

Conclusion: The care received by patients at dental emergency services was effective in relieving their dental pain and improving their oral health status. Additionally, the effectiveness of dental care did not vary across the three hospitals, as measured by change in dental pain, however, it did vary across hospitals, when effectiveness was measured by change in quality of life.

5.2 Introduction

The Chilean health system is characterized by duality in the form of health insurance, with formal workers given the possibility of choosing to contribute to private insurance (ISAPREs) or to public insurance (FONASA) through compulsory contributions of 7% of their salary. Most of the Chilean population, xx %, receives public health insurance (FONASA) (1). Access to routine dental care services is available only at specific ages: for children aged 2, 4, 6, and 12 years, as well as adults at age 60 and all pregnant women (2). These restrictions produce a sizable gap between the need for and access to treatment. For this reason, the majority of the Chilean population must resort to the utilizing emergency dental services to fulfill their needs for care and treatment (3).

The public sector provides "walk-in" dental emergency services in various settings of the public healthcare network: in primary healthcare centers that provide care during workday hours, dental emergency services (SAPUDENT acronym of the name in Spanish) located in primary healthcare centers that provide after-hour services, and dental emergency services in the Public Hospital that provide 24/7 care (3).

More than 40 percent of the emergency services' visits to the Hospital de Urgencia de la Asistencia Pública (HUAP) were reportedly due to dental problems(4). In 2014, there were 17,028,551 visits to the emergency department to the establishment belonging to the government facilities, of which 2,658,920 (16%) were due to dental causes (5). Given the high demand for dental emergency services, determining the effectiveness of these services is imperative.

Effectiveness is one of the dimensions of health care performance. Health care performance refers to the maintenance of an efficient and equitable system of health care (6). The dimensions of health care performance are definable, preferably measurable, attributes of the system that are related to its functioning to maintain, restore or improve health (7). The key dimensions of health care performance vary according to the conceptual framework used. The Institute of Medicine (IOM)'s conceptual framework for health care system performance has defined six dimensions of performance (8):

- ***Safe:*** service delivery that is free of accidental injury.
- ***Effective:*** providing services based on scientific knowledge to all who could benefit and refraining from offering services to those not likely to benefit.
- ***Patient-centered:*** delivery of services in a manner that demonstrates respect for and honors patients' individual preferences and values.
- ***Timely:*** services that are free from undesirable and unnecessary delays.
- ***Efficient:*** services that are delivered without waste of resource inputs.
- ***Equitable:*** a pattern of care delivery that does not vary by factors unrelated to individual health needs (e.g., age, gender, race, income, education, location).

Clinical effectiveness is a performance dimension, wherein a hospital, in line with the current state of knowledge, appropriately and competently delivers clinical care or services to, and achieves desired outcomes for all patients likely to most benefit (8, 9). The sub-dimensions of clinical effectiveness are conformity of processes of care, outcomes of processes of care, and appropriateness of care. Outcomes that have been used to evaluate the clinical effectiveness of dental emergency services have been pain relief (10-13) and oral health gain experienced (12, 13) by the patient attending to these services.

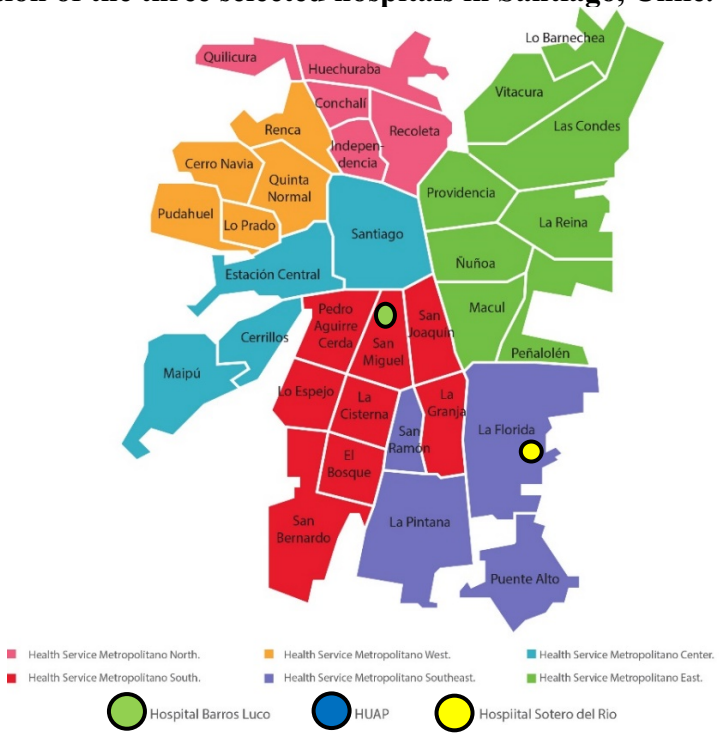
The purpose of this study is to determine whether the care received by patients of dental emergency services within three hospitals in Santiago, Chile is effective in relieving their dental pain and/or improving their oral health status. The hypothesis was that the effectiveness of dental care does not vary across the three hospitals included in this study.

5.3 Methods

Design: The study design was an uncontrolled before-after study; intervention was treatment at the dental emergency service.

Hospital selection: A purposive sampling strategy was used for hospital selection. Almost one-third of the country's population live in Santiago, the capital of Chile, or approximately 6 million inhabitants. In 2007 there were six hospitals that had dental emergency services that operated on a 24/7 basis (3) in Santiago. Of those six, one was a pediatric hospital, which was excluded from this study, and another no longer provided dental emergency services. Of the remaining four, the three hospitals with greater numbers of dental emergencies were selected (Figure 1).

Figure 2: **The location of the three selected hospitals in Santiago, Chile.**



Study Participants: The study population included individuals who sought oral health-related care at one of the three hospital's Emergency Departments (ED).

Data collection: all patients who were waiting in the dental emergency services were approached to participate in the study during weekday work hours between April - November, 2018. A trained interviewer briefly explained the study, including eligibility criteria, and asked if the patient would be willing to participate. If the patient agreed to participate, they were taken to a private room where the interviewer went over the informed consent paperwork. After the consent form was signed, the patient completed an interviewer-administered survey. A date and time for the follow-up survey was determined. The follow-up interview was conducted by phone seven days later (with an allowable range of 5-10 days); patients were contacted up to three times and if not reached by the third time were declared lost to follow-up. Additional data on the patient's clinical diagnosis and treatment was obtained from the dentist who provided treatment at the patient's initial

presentation. A member of the research team completed the dentist form. Note: Only two of the three hospitals provided the dentists' clinical diagnosis and treatment due to staff availability.

Inclusion/ Exclusion Criteria:

Inclusion criteria: Individuals who 1) received dental emergency care at one of the selected hospitals during the recruitment period, 2) were age ≥18 years, 3) were able to provide informed consent and verbally respond to the study questionnaires, and 4) indicate that would be available for the phone follow-up.

Exclusion criteria: Individuals who were under the age of 18 and were unable to provide informed consent or a reliable account of information due to psychiatric or cognitive disorders, and any underlying factors that prevented voluntary participation, as determined by a next of kin or health care professional at the emergency services department.

Ethical Considerations: The Harvard Longwood Medical Area Institutional Review Board (IRB) determined this study to be exempt (IRB17-1477). The study was also reviewed and approved by each of the Institutional Review Boards of the three hospitals included in the study.

Questionnaires: The *pre- surveys* (Appendix 1) included demographic data, patient's self-reported pain level, and patient's self-reported oral health-related quality of life. Demographic information collected included age, sex, educational level, type of health insurance, citizenship and municipal district where they lived and worked. Patient-reported level of pain was measured using a Visual Analogue Scale (VAS), which ranges from 0 to 100, with 0 indicative of feeling no pain and 100 feeling the worst pain imaginable. Patient-reported oral health-related quality of life was assessed using the Dental Health Status Quality of Life Questionnaire (DS-QoL), which ranges from 6 to 18, where 6 was the best quality of life and 18 the worst quality of life possible (14, 15). The *post-surveys* (Appendix 2) included VAS and DS-QoL scores and questions about patient satisfaction,

measured with the patient experience questionnaire (PEQ), section B (16). The *dentist form* (Appendix 3) included clinical diagnosis and treatment given to the patient.

Definitions and Measures: The questionnaire was subdivided into three main sections: 1) Demographic information, 2) Pain experience and, 3) Patient satisfaction. Results from section 1 and 3 are discussed in chapters three and five. This chapter primarily focuses on section 2 (Pain experience).

Variable Description: Variables are described in Table 2.

Table 1: Variables definition, type and category.

Name	Definition	Data Type	Category
Hospital	Institutions with an organized medical staff which provide medical care to patients.	Nominal	Barros Luco
			HUAP
			Sotero del Rio
Age	The length of time during which a being has existed; measured in years.	Discrete	In years
Sex	The totality of characteristics of reproductive structure, functions, PHENOTYPE, and GENOTYPE, differentiating the MALE from the FEMALE organism.	Nominal	Female
			Male
Educational status	Educational attainment or level of education of individuals.	Nominal	Elementary School
			High School
			Trade School
			College
Health Insurance	Socio-economic status, according to the type of health insurance.	Nominal	FONASA A
			FONASA B
			FONASA C
			FONASA D
			ISAPRE
			Other
Citizenship	The status of being a citizen of a country.	Nominal	Chilean
			Other
Home address	Municipal district of the home address.	Nominal	Santiago Centro
			San Miguel
			Puente Alto
			Other
			No Answer
Work address	Municipal district of the work address.	Nominal	Santiago Centro
			San Miguel
			Puente Alto
			Other
			No Answer

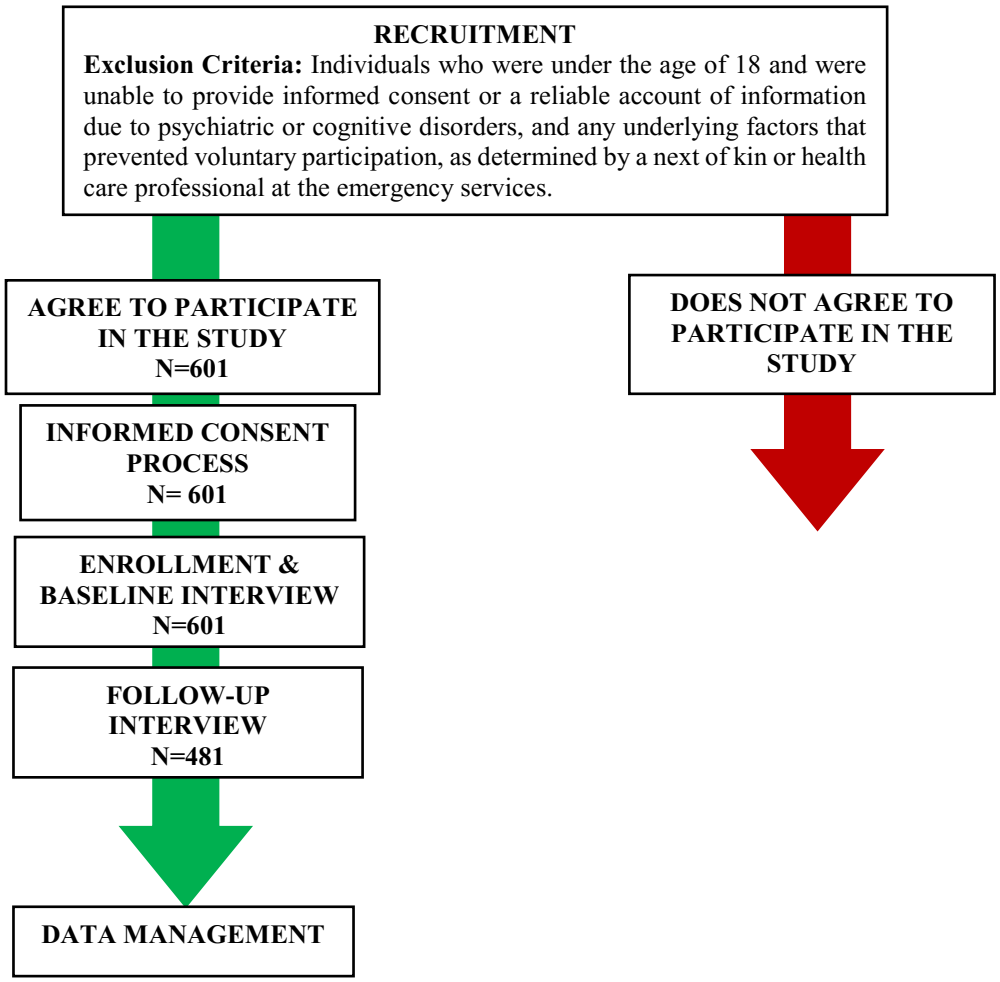
Chief complaint	The primary symptom that a patient states as the reason for seeking dental care.	Nominal	Toothache or pain in mouth
			Loss of fillingo r crown
			Dento-alveolar trauma
			Swelling in the mouth
			Other
Pain Relief	Level of alleviation of pain between before and after treatment. Calculated as VAS score pre-treatment less VAS score post-treatment.	Ordinal	Considerable or total pain relief (Value between 1 and a 100 points)
			No pain relief (Value equal to 0)
			Worse pain (Value between -1 and a -100 points)
DS-QoL	Self-assessed oral health status.	Discrete	Value between 1 and 18 points
VAS	Level of pain.	Discrete	Value between 0 and 100 points
Change from baseline in pain level	Pain score before treatment less pain score after treatment. Calculated as VAS score pre-treatment less VAS score post-treatment.	Discrete	Value between -100 and 100.
Change from baseline in oral health status	QoL score before treatment less QoL score after treatment. Calculated as DS-QoL score pre-treatment less DS-QoL score post-treatment.	Discrete	Value between -18 and 18.
Diagnosis	Determination of the nature of a disease or condition made by a dentist.	Nominal	Pulp and Perical lesions
			Gingival and Periodontal conditions
			Mouth celulitis or abcess
			Disorders of teeth eruption
			Dental Trauma, tooth fracture or radicular rest
			Complication of tooth extraction
			Other
Treatment	Procedures concerned with the care provided.	Nominal	Antibiotic prescription
			Other prescription
			Tooth extraction
			Other

Chilean health insurance is a two-tiered system. It includes public insurance, which covers 76% of the population and is funded through a public agency, Fondo Nacional de Salud (FONASA), and private insurance (ISAPREs), which covers 19% of the population (17). The public insurance, FONASA, divides beneficiaries into four groups depending on monthly salary (Table 2) (18).

Table 2: Chilean Public insurance (FONASA) by section (18).

Section	Beneficiaries of the Section
FONASA A	Beneficiaries lacking resources to pay contributions in health, or in conditions of indigence (non-contributors).
FONASA B	Beneficiaries with incomes less than U$ 450 per month (contributors) Workers in the public health sector
FONASA C	Beneficiaries with incomes between U$ 450 and $655 per month (contributors)
FONASA D	Beneficiaries with income of U$ 656 and more per month (contributors)

Figure 2: **Participant Recruitment and Data Collection Process.**



Sample Size: To calculate the sample size, effect size was established from the data collected through a pilot study. The effect size for the level of pain was 10 points with a standard deviation

of 30, and the effect size for quality of life was 25 with a standard deviation of 100. With a power of 80%, the *n* for the level of pain was 73 and 128 for quality of life. Given that the *n* for quality of life was larger, that value was used as a goal sample size. The expected loss to follow-up was set at 15%, resulting in a total sample of 150 patients per hospital and a total of 450 patients enrolled in the study. The study enrolled and interviewed 601 patients, 200 from each hospital.

Data Management and Analysis: Data were collected during the in-person interview using paper forms when with study subjects and when recording the data from the dentist questionnaire. All paper documentation was given an ID number per patient and all patient identifiers were removed. Paper documentation was scanned and electronically stored in a password protected file. Data was entered into a secure database and was stored in a password protected cloud file.

All statistical analyses were performed using STATA 14-Wilk test was performed to determine the normality of the data. The Kruskall-Wallis test were performed to test if there was a difference between the effectiveness of the dental emergency services among hospitals using change in the level of pain (VAS scores) and quality of life (DS-QoL) scores. Linear regression was used to identify variables associated with the effectiveness of the dental emergency services.

5.4 Results

In this study, 601 patients participated, with 120 (20%) lost to follow-up between the emergency department visit and follow-up assessment by phone. Of the individuals who participated, 182 went to Hospital Barros Luco, 237 went to Hospital de Urgencia Asistencia Publica (HUAP) and 182 went to Hospital Sotero del Rio. The loss to follow-up between the pre- and post-assessments by hospital was 29 (16%), 71 (30%) and 20 (11%) respectively. See Tables 3 and 4 for details about the variables distribution between patient with and without follow-up. The distribution of

patients with and without follow-up only have a statistically significant difference in the following variables; hospital attended, municipal district of residence, diagnosis of chief complaint and treatment provided.

Table 3: Distribution of demographic characteristics and chief complaint between patients (n=601) with and without follow-up.

VARIABLE	Category	With Follow-up		Without Follow-up		p
Age	Mean	38		37		0.7892
	S.D.	14.35		13.86		
	Minimum	18		18		
	Maximum	85		75		
Pain Score Pre-Treatment	Mean	64.83		64.97		0.8697
	S.D.	28.89		30.29		
	Minimum	0		0		
	Maximum	100		100		
Quality of Life Score Pre-Treatment	Mean	13.29		13.25		0.8702
	S.D.	2.77		2.81		
	Minimum	6		6		
	Maximum	18		18		
		N	**%**	**n**	**%**	**p**
Sex	Female	279	58	64	53	0.355
	Male	202	42	46	47	
Hospital Attended	Hospital Barros Luco	153	32	29	24	**<0.0001**
	HUAP	166	34	71	59	
	Hospital Sotero del Rio	162	34	20	17	
Educational Level	Elementary School	70	15	15	13	0.515
	High School	237	50	54	46	
	Trade School	103	22	28	24	
	College	62	13	21	17	
Health Insurance	FONASA A	106	22	30	25.5	0.839
	FONASA B	107	23	22	19	
	FONASA C	84	18	20	17	
	FONASA D	117	25	30	25.5	
	ISAPRE	9	2	4	3	
	Other	50	10	12	10	
Citizenship	Chilean	442	92	103	87	0.071
	Other	39	8	16	13	

Municipal District of residence	Santiago Centro	37	8	16	13	**0.004**
	San Miguel	15	3	1	1	
	Puente Alto	88	18	8	7	
	Other	338	70	93	77	
	No Answer	3	1	2	2	
Municipal District of work	Santiago Centro	61	13	17	14	0.131
	San Miguel	12	2	1	1	
	Puente Alto	28	6	4	3	
	Other	208	43	42	35	
	No Answer	172	36	56	47	
Chief Complaint	Toothache/ Pain in mouth	379	79	94	78	0.855
	Lost Filling or crown	11	2	3	2.5	
	Dento-alveolar trauma	53	11	12	10	
	Swelling in mouth	11	2	2	2	
	Other	27	6	9	7.5	

Table 4: Distribution of clinical characteristics between patients (N=417) with and without follow-up.

	Category	With Follow-up		Without Follow-up		p
		n	%	n	%	
Diagnosis of chief complaint	Pulp and Periapical lesions	89	27	29	32	**<0.0001**
	Gingival and Periodontal conditions	135	41	27	30	
	Mouth cellulitis or abscess	20	6	6	7	
	Disorders of teeth eruption	35	11	8	9	
	TDA or Tooth fracture or RR	17	5	1	1	
	Complication of tooth extraction	13	4	0	0	
	Other	18	6	19	21	
Treatment provided	Antibiotic prescription	28	9	10	11	**0.001**
	Other prescription	49	15	2	2	
	Tooth extraction	231	71	65	72	
	Other	18	5	13	15	

Note: The clinical characteristics from Hospital Barros Luco were not available because the dentist questionnaire could not be collected at this hospital.

After treatment, 432 patients (90%) reported considerable or total pain relief, 37 patients (7.5%) showed no pain relief and only 12 patients (2.5%) showed worse pain than before seeking care at the dental emergency services (See Table 5).

Table 5: Number and percentage of patients with varying levels of pain after seeking care within each hospital site.

VARIABLE	Category	Total Sample		Hospital Barros Luco		HUAP		Hospital Sotero del Rio	
		N	%	n	%	n	%	N	%
Pain Relief	Considerable or total pain relief	432	90	132	86	150	90	150	92
	No pain relief	37	7.5	18	12	10	6	9	6
	Worse pain	12	2.5	3	2	6	4	3	2

The Shapiro-Wilk test determined that the level of pain (VAS) and oral health quality of life (DS-QoL) data were not normally distributed. Therefore, the median was used as the measure of central tendency. Median levels of pain before and after the hospital visit were 70 (range 0-100) and 0 (range 0-100), respectively, meaning patients before they treatment were in moderately high pain and after they had treatment, they show a complete absence of pain. The pre- and post-treatment medians of quality of life scores (DS-QoL) were 13 (range 6-18) and 7 (range 6-18), respectively (Table 6; Figures 3 and 4), patient's quality of life oral health related was moderate low before treatment and after treatment was high.

Table 6: Distribution of level of pain based on visual analogue scale (VAS) and oral health quality of life (DS-QoL) pre- and post-treatment for each hospital site.

VARIABLE	Treatment Category	Hospital Barros Luco		HUAP		Hospital Sotero del Rio	
		Median	Range	Median	Range	Median	Range
VAS	Pre	70	0-100	70	0-100	70	0-100
	Post	0	0-100	0	0-90	0	0-90
DS-QoL	Pre	15	6-18	13	7-18	12	6-18
	Post	7	6-18	6	6-15	8	6-15

Figure 3: Distribution of pain levels as measured by visual analogue scale (VAS) pre- and post-treatment for each hospital site.

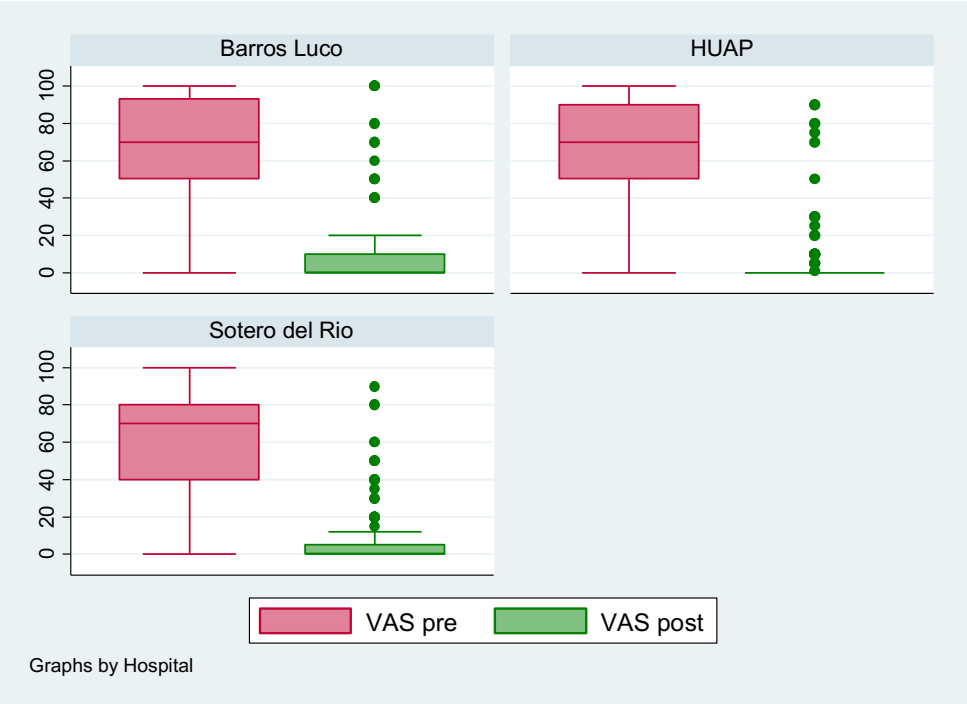
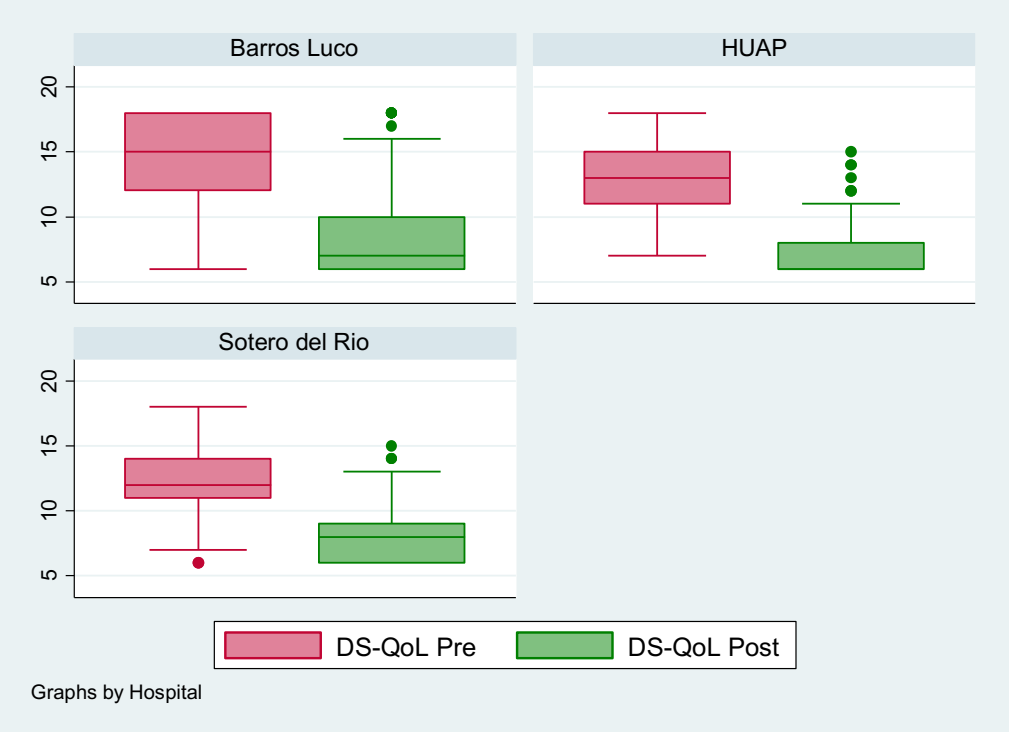


Figure 4: Distribution of oral health related quality of life (DS-QoL) pre- and post-treatment for each hospital site.



Patients within each hospital site reported much lower pain levels between their initial visit to the dental emergency services and a week after receiving treatment ($p < 0.00001$ for each hospital). The Wilcoxon matched-pairs signed-ranks test for oral health quality of life (DS-QoL) yielded $p < 0.00001$ for each hospital site, which showed there was a highly statistically significant difference for patients reported oral health-related quality of life before and after receiving treatment for their dental emergency.

Table 7: Comparison across three hospitals regarding change in pain and quality of life scores pre- and post-treatment among patients accessing the emergency department for dental care in Santiago, Chile.

	Hospital Barros Luco	HUAP	Hospital Sotero del Rio
VAS	<0.00001	<0.00001	<0.00001
DS-QoL	<0.00001	<0.00001	<0.00001

There was not difference ($p=0.3430$) among hospitals in the effectiveness of dental emergency services, measured in change in level of pain. However, there was a statistically significant difference ($p=0.0001$) among hospitals in the effectiveness of dental emergency services, measured by change in quality of life.

The variables associated with change from baseline for pain level were health insurance, chief complaint and treatment provided (Table 8). Meaning, that for pain relief the factors that showed an association were health insurance, chief complaint and diagnosis, specifically if you have FONASA B as health insurance, the change from baseline in pain level decrease by 10 points; if your chief complaint is toothache, the change from baseline in pain level increase by 28 points and if your diagnosis is pulp and periapical lesions, the change from baseline in pain level increase by 23 points.

Table 8: Univariate analysis of variables associated with change from baseline for pain level.

Variable	Category	β- Coefficient	95% IC	*p*-value
Age	In years	-0.186	(-0.396, 0.025)	0.083
Sex	Female (reference)	1	-	-
	Male	0.033	(-6.089, 6.156)	0.991
Educational Level	Elementary School (reference)	1	-	-
	High School	-5.325	(-14.354, 3.705)	0.247
	Trade School	-2.266	(-12.548, 8.017)	0.665
	College	-6.846	(-18.422, 4.731)	0.246
Health Insurance	FONASA A (reference)	1	-	-
	FONASA B	-10.166	(-19.215, -1.116)	**0.028**
	FONASA C	-7.988	(-17.634, 1.658)	0.104
	FONASA D	-6.846	(-15.701, 2.009)	0.129
	ISAPRE	-7.171	(-30.098, 15.756)	0.539
	Other	-3.646	(-14.975, 7.683)	0.527
Citizenship	Chilean (reference)	1	-	-
	Other	5.111	(-5.949, 16.171)	0.364
Hospital Attended	Hospital Barros Luco (reference)	1	-	-
	HUAP	1.713	(-5.713, 9.138)	0.651
	Hospital Sotero del Rio	-2.379	(-9.849, 5.089)	0.532
Chief complaint	Other (reference)	1	-	-
	Toothache/ Pain in mouth	28.294	(15.612, 40.976)	**<0.0001**
	Lost Filling or crown	8.299	(-14.474, 31.073)	0.474
	Dento-alveolar trauma	6.765	(-8.289, 21.818)	0.378
	Swelling in mouth	4.118	(-18.655, 26.891)	0.723
Diagnosis	Other (reference)	1	-	-
	Pulp and Periapical lesions	23.064	(6.616, 39.512)	**0.006**
	Gingival and Periodontal conditions	15.570	(-0.399, 31.539)	0.056
	Mouth cellulitis or abscess	8.283	(-12.394, 28.960)	0.431
	Disorders of teeth eruption	16.047	(-2.412, 34.507)	0.088
	TDA or Tooth fracture or RR	-0.196	(-21.720, 21.328)	0.986
	Complication of tooth extraction	3.718	(-19.446, 26.882)	0.752
Treatment provided	Other (reference)	1	-	-
	Antibiotic prescription	16.056	(-3.425, 35.537)	0.106
	Other prescription	10.209	(-7.564, 27.981)	0.259
	Tooth extraction	13.045	(-2.735, 28.825)	0.105

Note: Bold text signifies statistical significance (i.e. $p<0.05$)

The variables associated with change from baseline for oral health status were hospital attended, chief complaint and diagnosis (Table 9). Meaning that for improvement of oral health the factors that showed an association were hospital attended, chief complaint and diagnosis, specifically if you attended Hospital Sotero del Rio, the change from baseline in oral health status decrease by 1.4 point; if your chief complaint is toothache, the change from baseline in pain level increase by 1.8 point and if your diagnosis is pulp and periapical lesions, Mouth cellulitis or abscess or Disorders of teeth eruption, the change from baseline in pain level increase by 2.9, 2.2 or 2.07 points respectively.

Table 9: Univariate analysis of variables associated with change from baseline for oral health status.

Variable	Category	β- Coefficient	95% IC	*p*-value
Age	In years	-0.008	(-0.305, 0.014)	0.476
Sex	Female (reference)	1	-	-
	Male	-0.399	(-1.046, 0.247)	0.226
Educational Level	Elementary School (reference)	1	-	-
	High School	-0.294	(-1.247, 0.660)	0.545
	Trade School	-0.217	(-1.304, 0.869)	0.694
	College	-0.203	(-1.426, 1.019)	0.744
Health Insurance	FONASA A (reference)	1	-	-
	FONASA B	-0.549	(-1.504, 0.405)	0.259
	FONASA C	-0.378	(-1.396, 0.639)	0.466
	FONASA D	0.055	(-0.879, 0.988)	0.909
	ISAPRE	0.328	(-2.091, 2.747)	0.790
	Other	-1.023	(-2.218, 0.172)	0.093
Citizenship	Chilean (reference)	1	-	-
	Other	0.223	(-0.948, 1.394)	0.708
Hospital Attended	Hospital Barros Luco (reference)	1	-	-
	HUAP	0.109	(-0.661, 0.881)	0.779
	Hospital Sotero del Rio	-1.425	(-2.200, -0.649)	**<0.0001**
Chief complaint	Other (reference)	1	0	0
	Toothache/ Pain in mouth	1.817	(0.442, 3.194)	**0.010**
	Lost Filling or crown	-0.946	(-3.418, 1.525)	0.452

	Dento-alveolar trauma	0.604	(-1.029, 2.238)	0.468
	Swelling in mouth	1.054	(-1.418, 3.525)	0.403
Diagnosis	Other (reference)	1	-	-
	Pulp and Periapical lesions	2.951	(1.501, 4.401)	**<0.0001**
	Gingival and Periodontal conditions	1.067	(-0.341, 2.475)	0.137
	Mouth cellulitis or abscess	2.283	(0.460, 4.107)	**0.014**
	Disorders of teeth eruption	2.076	(0.448, 3.704)	**0.013**
	TDA or Tooth fracture or RR	0.216	(-1.682, 2.114)	0.823
	Complication of tooth extraction	1.026	(-1.017, 3.068)	0.324
Treatment	Other (reference)	1	-	-
	Antibiotic prescription	0.159	(-1.600, 1.918)	0.859
	Other prescription	-0.872	(-2.477, 0.733)	0.286
	Tooth extraction	0.542	(-0.883, 1.967)	0.455

Note: Bold text signifies statistical significance (i.e. $p<0.05$)

The multivariable linear regression model for change from baseline for pain level was constructed adding all three variables found that presented statistically significative difference in the univariable linear regression; the variables were type of health insurance, chief complaint and diagnosis. For detail in the multivariable linear regression see Table 10. The multivariable linear regression established that type of health insurance, chief complaint and diagnosis could statistically significantly predict change from baseline for pain level, $F(15, 311) = 3.00$, $p = 0.0002$ and this model accounted for 8.43% of the explained variability in change from baseline for pain level.

Table 10: Multivariate analysis of variables associated with change from baseline for oral health status.

Variable	Category	β- Coefficient	95% IC	*p*-value
Health Insurance	FONASA A (reference)	1	-	-
	FONASA B	-8.588	(-19.446, 2.270)	0.121
	FONASA C	-9.402	(-21.190, 2.385)	0.118
	FONASA D	-11.634	(-22.215, -1.052)	**0.031**
	ISAPRE	-2.112	(-32.125, 27.901)	0.890
	Other	-3.469	(-17.384, 10.447)	0.624

Chief complaint	Other (reference)	1	-	-
	Toothache/ Pain in mouth	26.636	(6.629, 46.642)	**0.009**
	Lost Filling or crown	12.419	(-15.473, 40.311)	0.382
	Dento-alveolar trauma	7.146	(-15.006, 29.298)	0.526
	Swelling in mouth	5.179	(-23.301, 33.659)	0.721
Diagnosis	Other (reference)	1	-	-
	Pulp and Periapical lesions	21.811	(5.390, 38.232)	**0.009**
	Gingival and Periodontal conditions	14.503	(-1.208, 30.215)	0.070
	Mouth cellulitis or abscess	13.064	(-8.582, 34.709)	0.236
	Disorders of teeth eruption	11.549	(-6.654, 29.752)	0.213
	TDA or Tooth fracture or RR	4.544	(-16.825, 25.913)	0.676
	Complication of tooth extraction	10.906	(-12.067, 33.879)	0.351

Note: Bold text signifies statistical significance (i.e. $p<0.05$)

The variables found that presented statistically significative difference in the univariable linear regression for change from baseline in oral health status were hospital attended, chief complaint and diagnosis. Due that variable diagnosis was only available for two of the three hospital sites we constructed two multivariable linear regression models. The first model was constructed with the variables hospital attended and chief complaint, that were available for all patients with follow-up. For detail in this first multivariable linear regression model for change from baseline in oral health status see Table 11. This multivariable linear regression established that hospital attended and chief complaint could statistically significantly predict change from baseline in oral health status, $F(6, 474) = 5.94$, $p<0.00001$ and this model accounted for 5.81% of the explained variability in change from baseline in oral health status.

Table 11: Multivariate analysis of variables associated with change from baseline for oral health status.

Variable	Category	β- Coefficient	95% IC	*p*-value
Hospital Attended	Hospital Barros Luco (reference)	1	-	-
	HUAP	0.061	(-0.709, 0.832)	0.876
	Hospital Sotero del Rio	-1.406	(-2.190, -0.622)	**<0.0001**
Chief complaint	Other (reference)	1	-	-
	Toothache/ Pain in mouth	1.995	(0.629, 3.359)	**0.004**
	Lost Filling or crown	-0.448	(-2.905, 2.008)	0.720
	Dento-alveolar trauma	0.974	(-0.656, 2.603)	0.241
	Swelling in mouth	1.679	(-0.788, 4.147)	0.182

Note: Bold text signifies statistical significance (i.e. p<0.05)

The second model was constructed with all three variables that presented statistically significative difference in the univariable linear regression for change from baseline in oral health status, those were hospital attended, chief complaint and diagnosis. For detail in the second multivariable linear regression model for change from baseline in oral health status see Table 12. This multivariable linear regression established that hospital attended, chief complaint and diagnosis could statistically significantly predict change from baseline in oral health status, $F(11, 315) = 5.33$, $p < 0.00001$ and this model accounted for 12.74% of the explained variability change from baseline in oral health status.

Table 12: Multivariate analysis of variables associated with change from baseline for oral health status.

Variable	Category	β- Coefficient	95% IC	*p*-value
	HUAP (reference)	1	-	-
	Hospital Sotero del Rio	-1.034	(-1.807, -0.261)	**0.009**
Chief complaint	Other (reference)	1	-	-
	Toothache/ Pain in mouth	1.674	(-0.085, 3.435)	0.062
	Lost Filling or crown	-0.508	(-2.951, 1.934)	0.682
	Dento-alveolar trauma	0.571	(-1.352, 2.493)	0.560
	Swelling in mouth	1.024	(-1.479, 3.526)	0.422

Diagnosis	Other (reference)	1	-	-
	Pulp and Periapical lesions	2.393	(0.946, 3.839)	**0.001**
	Gingival and Periodontal conditions	1.368	(-0.065, 2.802)	0.061
	Mouth cellulitis or abscess	2.124	(0.215, 4.033)	**0.029**
	Disorders of teeth eruption	1.661	(0.050, 3.272)	**0.043**
	TDA or Tooth fracture or RR	0.574	(-1.307, 2.454)	0.549
	Complication of tooth extraction	1.600	(-0.426, 3.656)	0.121

Note: Bold text signifies statistical significance (i.e. $p<0.05$)

*Variable treatment only available for two hospitals (HUAP and Sotero del Rio)

5.5 Discussion

The purpose of this study was to examine the effectiveness of dental treatment within a population that used dental emergency services in three hospitals in Santiago, Chile. Most patients (over 90%) reported considerable or total pain relief and only a few (2.5%) stated having worse pain than before seeking care at the dental emergency services.

In this study we recruited and interviewed 601 patients seeking care in one of three dental emergency services hospital sites. Approximately one week after seeking treatment participants received a follow-up interview by phone; 481 patients (80%) completed the interview. This study's follow up rate was very robust compared to other studies which have measured effectiveness of dental emergency services: for example, a Canadian study (10) recruited 222 patients and completed a phone call follow-up with 109 patients (44%) 24-48 hours after the initial consultation, a study in the United Kingdom (UK) (11) recruited 200 patients and completed a phone call follow-up with 109 patients (49.1%) 24 hours after the initial consultation, and another UK study (12) recruited 783 patients and completed a letter survey follow-up with 423 patients (54%) up to 4 weeks after the initial consultation.

The distribution of patients with and without follow-up only have a statistically significant difference in the following variables; hospital attended, municipal district of residence, diagnosis of chief complaint and treatment provided. However, the difference in hospital attended is due to that at HUAP the loss of follow-up was higher than in the other hospital because of problems with the interviewers. There is a difference between patients with and without follow-up in municipal district of residence yet when analyzed in more detail, accounting by patient with and without follow-up and hospital attended, the distribution by hospital remains similar in patients with and without follow-up. The same is true for diagnosis of chief complaint and treatment provided.

To compare the effectiveness in pain relief of the dental emergency services between different studies, it is necessary to consider the way pain relief is measured. In one study (10), pain relief was measured with a dichotomous question (successful in resolving pain or unsuccessful), in another study (11), a 5-point Likert scale, ranging from 1 “pain completely solved” to 5 “pain much worse”, was used. A third group (12) used the same VAS score that was used in the current study.

In this study, 90% of the patients obtained considerable or total pain relief after receiving care. However, 7.5% showed no change in their pain level a week later and 2.5% had worse pain. This is similar to Matthews et al (11) which showed that 87% of patients had considerable or total pain relief, 8% showed no change and 5% had worse pain than before care was sought. The only remarkable difference between the current study and Matthews et al. (11) was that the Matthews study had twice as many patients with worse pain after receiving care.

Across the hospital sites the median VAS score before dental care was 70 and the median VAS score at follow-up was 0, which is similar to what Anderson et al. (12) found. In that study, the median VAS score at dental attendance was 77 and median VAS score at follow-up was 4.

The median oral health related quality of life (Ds-QoL) score before dental care was 15 and the median score at follow-up was 7. Unfortunately, we are unable to make a direct comparison of these scores with other studies since oral health-related quality of life was measured in a different manner (12).

All hospitals showed in patients' reported pain level (VAS score) and oral health related quality of life score (DS-QoL) before and after receiving treatment at dental emergency services. There were no consistent differences in average effectiveness between the three different hospitals in the study, when assessed by pain relief. However, there were in average effectiveness among hospitals, when assessed as increase in oral health related quality of life. So, effectiveness for patients who received care is equivalent across hospitals, in pain relief but not in increase of quality of life.

When several univariate linear regression models were fit to identify variables associated with the effectiveness of the dental emergency services, variables significantly associated with pain relief were health insurance, chief complaint and diagnosis. One possibility for this finding is that patients whose chief complaint was pain-driven, such as a toothache or dentoalveolar trauma. may be more likely to report reduced pain after receiving care compared to other patients whose chief complaints may not be pain-driven (i.e., loss of tooth or restoration). Similarly, patients with diagnosis of acute conditions, as pulp and periapical lesions may be more likely to report reduced pain after receiving care compared to other patients whose diagnosis were of chronical nature.

Additionally, when several univariate linear regression models were fit to identify variables associated with the effectiveness of the dental emergency services sought, the variables significantly associated with increased oral health related quality of life were hospital attended, chief complaint, and diagnosis. It was unexpected that the variable hospital attended is associated with change from baseline for oral health status and we again recommend performing a qualitative

study to understand to why is this. One possible explanation for the finding that chief complain and diagnosis is associated to increase in oral health related quality of life, is that patients whose chief complaint was pain-driven and patients whose diagnosis was the character acute may be more likely to report reduced pain and therefore improved oral health related quality of life.

All patients in the study received treatment, that is, there was no "control" group of patients who were not seen or treated in the hospital emergency department, because it's not ethical to deny treatment. One possible explanation for the decrease in pain after the hospital visit is 'regression to the mean'; that is, simply due to natural, random variation amongst a group of patients whose baseline health state is near the extreme of a scale.

5.6 Conclusion

Each of the hospitals' dental emergency services were effective in relieving patients' dental pain and improving their oral health status. Additionally, the effectiveness of dental care did not vary across the three hospitals, when assessed by changes in pain level, however, effectiveness of care did vary when measured by changes in oral health-related quality of life/oral health status.

5.7. References

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6. Chapter 5: Patient Satisfaction with Dental Emergency Services

6.1 Abstract

Objective: To establish patient satisfaction with the care received at the dental emergency services in three hospitals in Santiago, Chile.

Methods: The study design was an uncontrolled before-after study; intervention was treatment at the dental emergency service. Patients seeking dental emergency services at one of three hospitals in Santiago, Chile were interviewed before (in person) and after (by telephone) receiving treatment. Patients completed interviewer administered surveys which asked about patient's self-reported pain level, oral health-related quality of life, and demographic information. Self-reported pain level was measured using a Visual Analogue Scale (VAS) and oral health quality of life was measured using the Dental Health Status Quality of Life Questionnaire (DS-QoL); higher values indicated greater pain and less quality of life. The *post-surveys* were given approximately one week later and included patient's self-reported pain (VAS), patient's oral health-related quality of life (DS-QoL) and patient's level of satisfaction as measured by the patient experience questionnaire (PEQ). VAS and DS-QoL were measured before and after the dental visit and PEQ was measured after the visit. Median values for the three sections of patient satisfaction (PEQ) for the total sample and by hospital were calculated. To test if there was a difference between the level of satisfaction between hospitals, a Kruskall-Wallis test was be performed because the data was skewed data. An ordinal logistic regression model was fit for patient satisfaction and was used to identify variables significantly associated with the dimensions of patient satisfaction.

Results: A total of 601 patients across the three hospitals in Santiago, Chile were recruited and interviewed before receiving dental care. Eighty percent (n=481) were interviewed at follow-up 7 to 10 days after the initial visit. The median for overall satisfaction was 6, with a maximum of 7. Patient satisfaction was comprised of the median for Interpersonal satisfaction was 30, with a maximum of 35, and the median Technical satisfaction was 20, with a maximum of 20. Using univariate analysis, the factors associated with variation in overall satisfaction were age, type of health insurance, hospital attended, change from baseline in pain level, pain score post-attention, change from baseline in oral health status and type of treatment received. In multivariate analyses, health insurance, pain score post-attention, variation in quality of life and type of treatment received were independent factors for the change in quality of life score.

Conclusion: Although the care received by patients seeking dental emergency services was highly satisfactory, dental care satisfaction varied across the three study hospitals.

6.2 Introduction

Chile has two possible form of health insurance; people can choose between private insurance (ISAPREs) or public insurance (FONASA). Most of the population is affiliated with FONASA and access the public services (1). Currently in Chile, access to dental care is available for specific members of the population: children aged 2 years, 4 years, 6 years, and 12 years, as well as adults at age 60 and all pregnant women (2). These limitations in access to dental care create a sizable gap between the need for and access to dental care. For this reason, most of the Chilean population must resort to utilizing emergency dental services to fulfill their needs for care and treatment (3).

The government provides "walk-in" dental emergency services in various settings of the public healthcare network; in primary healthcare centers that provide attention during the work hours,

dental emergency services (SAPUDENT acronym of the name in Spanish) located in primary healthcare centers that provide afterhours services, and dental emergency services in the Public Hospital that provides 24/7 attention (3).

The Department of Statistics of the Chilean Ministry of Health reported that in the year 2014 there were 17,028,551 visits to the emergency department to the facilities belonging to the government network and 2,658,920 (15.61%) were due to dental causes (5). Given the high demand for dental emergency services, determining patient satisfaction with this service is necessary.

Acceptability is one of the dimensions of health care performance. Health care performance refers to the maintenance of an efficient and equitable system of health care (6). The dimensions of health care performance are those definable, preferable measurable, attributes of the system that are related to its functioning to maintain, restore or improve health (7). The key dimensions of health care performance vary according to the conceptual framework. Maxwell's (8, 9) conceptual framework for quality defined six dimensions of performance that capture these dimensions:

- ***Access:*** degree to which people are able to receive the service or treatment.
- ***Effectiveness:*** degree to which the service or treatment works.
- ***Equity:*** whether those with need can benefit from the service.
- ***Acceptability:*** patient experience and satisfaction with care received.
- ***Efficiency:*** cost of the service.
- ***Relevance:*** how well a service relates to the need of population.

Acceptability is conformity to the wishes, desires, and expectations of health care users and their families (10). The attributes of the acceptability dimension which Maxwell describes include standards of communication, privacy and conditions of the treatment environment (9).

Acceptability of care is measured though patient satisfaction and patient experience. Patient satisfaction is defined as positive evaluations of distinct dimensions of the received health care (11). Patient experience is defined as feedback from patients on "what actually happened" in the course of receiving care or treatment; both the objective facts and their subjective views of it (12).

Is important to mention that patient satisfaction is not a clearly defined concept, although it typically appears to represent attitudes to care or aspects of care (13). The issue of patient satisfaction with health care has gained importance for two reasons. First, patient satisfaction is believed to be one goal of health care delivery; as a consequence of the consumer movement the satisfaction of the consumer is seen as a necessary outcome of any transaction. Second, it is also believed that patient satisfaction is related causally to various health and illness behaviors. For example, it is widely believed that the satisfied patient will comply with the physician's instructions and keep future appointments (11).

Satisfaction is clearly a multidimensional concept and there is no single, easily understood definition that would apply to all patients (14). Patient satisfaction determinants are expectations, patient characteristics and psychosocial determinants (15). Several classifications of components of patient satisfaction have being proposed (15). Ware et al. (16) presented a classification with the following eight components:

- ***Interpersonal manner:*** features of the way in which providers interact personally with patients (e.g. respect, concern, friendliness, courtesy).
- ***Technical quality of care:*** competence of providers and adherence to high standards of diagnosis and treatment (e.g. thoroughness, accuracy, unnecessary risks, making mistakes).
- ***Accessibility/convenience:*** factors involved in arranging to receive medical care (e.g. waiting times, ease of reaching provider).

- ***Finances:*** factors involved in paying for medical services.
- ***Efficacy/outcomes of care:*** the results of services provided (e.g. improvements in or maintenance of health).
- ***Continuity of care:*** constancy in provider or location of care.
- ***Physical environment:*** features of the setting in which care is delivered (e.g. clarity of signs and directions, orderly facilities and equipment, pleasantness of atmosphere).
- ***Availability:*** presence of medical care resources (e.g. enough medical facilities and providers).

For patient satisfaction with dental care the components proposed are: technical competence, interpersonal factors, convenience, costs and facilities (17). However, studies have shown that patients evaluate the quality of their dental care according to their dentist's interpersonal communication and technical skills (18). Interpersonal communication is an important measure because patients judge the quality of care provided primarily on the "soft skills" of the clinician (12, 17, 19-21) or the relational aspects of care. Among the components of relational aspects of care are connection, attitude, communication, empowerment and feeling valued (19). Technical skills are highly valued for patients (21) and mentioned as being a key determinant of dental satisfaction (17). However, it has been put into question if patients may adequately judge the technical quality of care (17, 22, 23).

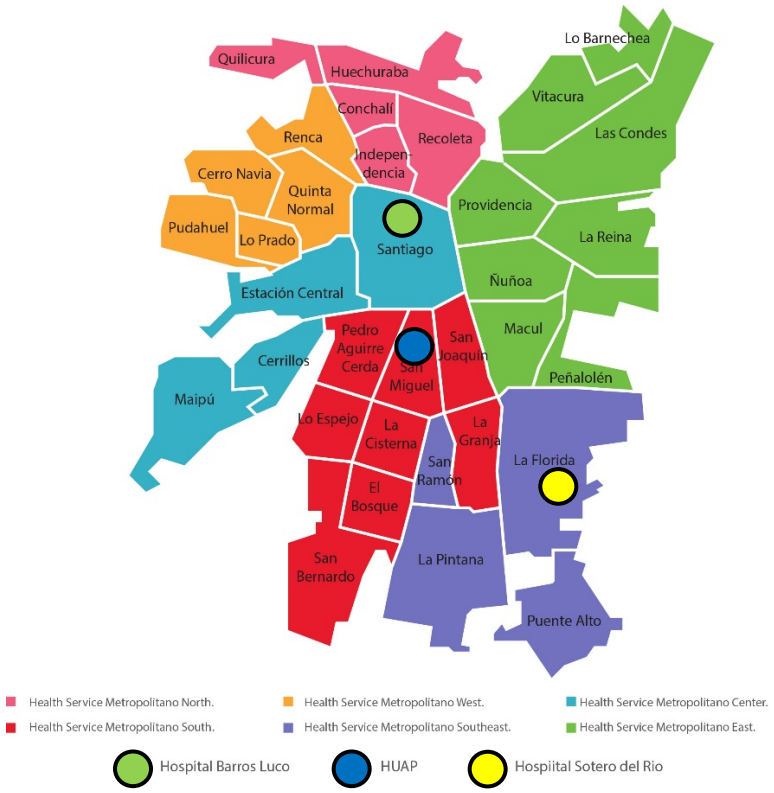
The purpose of this study was to establish patient satisfaction with the care received at the dental emergency services in three hospitals in Santiago, Chile. The hypothesis was that patient satisfaction with emergency dental care does not vary across the three hospitals.

6.3 Methods

Design: The study design was an uncontrolled before-after study; intervention was the treatment given by the dental attending at the dental emergency service.

Hospital selection: A purposive sampling strategy was used for hospital selection. Almost one-third of the country's population live in Santiago, the capital of Chile, or approximately 6 million inhabitants. In 2007 there were six hospitals that had dental emergency services that operated on a 24/7 basis (25) in Santiago. Of those six, one was a pediatric hospital, which was excluded from this study, and another no longer provided dental emergency services. Of the remaining four, the three hospitals with greater numbers of dental emergencies were selected; each hospital resides in a different municipality in Santiago (Figure 1).

Figure 3: **The location of the three selected hospitals in Santiago, Chile.**



Study Participants: The study population included individuals who sought oral health-related care at one of the three hospital's Emergency Departments (ED) included in this study.

Data collection: Patients who were waiting in the dental emergency services were approached to participate in the study during weekday work hours between April - November, 2018. A trained interviewer briefly explained the study, including eligibility criteria, and asked if the patient would be willing to participate. If the patient agreed to participate, they were taken to a private room where the interviewer went over the informed consent paperwork. After the consent form was signed, the patient completed an interviewer-administered survey. A date and time for the follow-up phone call survey was determined. The follow-up interview was conducted by phone seven days later (with an allowable range of 5-10 days); patients were contacted up to three times and if not reached by the third time were declared lost to follow-up. Additional data on the patient's clinical diagnosis and treatment was obtained from the dentist who provided treatment at the patient's initial presentation.

Additional data for the study was obtained from the dentist who treated the patient at the initial dental emergency services visit. A member of the research team completed the dentist questionnaire, this was only possible to do at two hospitals (HUAP and Hospital Sotero del Rio).

Inclusion/ Exclusion Criteria:

Inclusion criteria: Individuals who 1) received dental emergency care at one of the selected hospitals during the recruitment period, 2) were age ≥18 years, 3) were able to provide informed consent and verbally respond to the study questionnaires, and 4) indicate that would be available for the phone follow-up.

Exclusion criteria: Individuals who were under the age of 18 and were unable to provide informed consent or a reliable account of information due to psychiatric or cognitive disorders, and any

underlying factors that prevented voluntary participation, as determined by a next of kin or health care professional at the emergency services department.

Ethical Considerations: The Harvard Longwood Medical Area Institutional Review Board (IRB) determined this study to be exempt (IRB17-1477). The study was also reviewed and approved by each of the Institutional Review Boards of the three hospitals included in the study.

Questionnaires: Participants were interviewed by a trained member of the research team two times; pre- (in-person) and post- (by telephone) surveys. The *pre- surveys* (Appendix 1) included demographic data, patient's self-reported pain level, and patient's self-reported oral health-related quality of life. Demographic information collected included age, sex, country of origin, level of study, type of health insurance and municipal district where they lived and worked. Patient-reported level of pain was measured using a Visual Analogue Scale (VAS), which ranges from 0 to 100, with 0 indicative of feeling no pain and 100 feeling the worst pain imaginable. Patient-reported oral health-related quality of life was assessed using the Dental Health Status Quality of Life Questionnaire (DS-QoL), which ranges from 1 to 729, where 6 indicates the best quality of life and 18 the worst quality of life possible (24, 25). The *post- surveys* (Appendix 2) included VAS and DS-QoL scores and questions about patient satisfaction, measured with the patient experience questionnaire (PEQ), section B (26). The PEQ section B included modified questions from the Dental Visit Satisfaction Scale (DVSS) (27), which asked patients about the care they received within four sections; Interpersonal Satisfaction (7 items), Technical Satisfaction (4 items), Overall Satisfaction (1 item), and an open-ended comment on satisfaction. The Interpersonal Satisfaction section examined the patient satisfaction related to information and communication and understanding and acceptance. Each item was measured on a 5-point Likert scale from "very good" (1) to "very poor" (5) (total score range: 1 to 35), where a low score indicated lower

satisfaction and a high score indicated higher satisfaction. The Technical Satisfaction section asked patients to rate the technical competence of the patient's with dentists; whether the patient thought the dentist knew what they were doing, the thoroughness of the procedure, their satisfaction with the treatment and if they were treated gently. This dimension was measured on a 5-point Likert scale from "strongly agree" (5) to "strongly disagree" (1) (total score range: 1 to 20), where a low score indicated lower satisfaction and a high score indicated higher satisfaction. The Overall Satisfaction section was one item measured on a 7-point Likert scale from 'completely satisfied' (7) to 'completely dissatisfied' (1), "All things considered, how satisfied are you with your experience of treatment and care at the ED today?". A low score was indicative of low satisfaction and a high score of high satisfaction. The fourth section was an open question included to capture any additional comments. The *dentist form* (Appendix 3) included clinical diagnosis and treatment given to the patient.

Definitions and Measures: The questionnaire was subdivided into three main sections: 1) Demographic information, 2) Pain experience and, 3) Patient satisfaction. Results from section 1 and 2 are discussed in chapters three and four. This chapter primarily focuses on section 3 (Patient satisfaction).

Variable Description: Variables are described in Table 1.

Table 1: Variables definition, type and category.

Name	Definition	Data Type	Category
Overall Satisfaction	The degree to which the individual regards the health care service or product or the manner in which it is delivered by the provider as useful, effective, or beneficial.	Ordinal	Completely satisfied (7)
			Very satisfied (6)
			Fairly satisfied (5)
			Neutral (4)
			Fairly dissatisfied (3)
			Very dissatisfied (2)
			Completely dissatisfied (1)
Interpersonal Satisfaction		Ordinal	Very Good (More than 29 points)
			Good (Between 28 and 22 points)
			Fair (Between 21 and 15 points)
			Poor (Between 14 and 8 points)
			Very Poor (Less than 7 points)

Technical Satisfaction		Ordinal	Strongly Agree (More than 17 points)
			Agree (Between 16 and 13 points)
			Uncertain (Between 12 and 9 points)
			Disagree (Between 8 and 5 points)
			Strongly Disagree (Less than 4 points)
Age	The length of time during which a being has existed; measured in years.	Discrete	In years
Sex	The totality of characteristics of reproductive structure, functions, PHENOTYPE, and GENOTYPE, differentiating the MALE from the FEMALE organism.	Nominal	Female
			Male
Educational status	Educational attainment or level of education of individuals.	Nominal	Elementary School
			High School
			Trade School
			College
Health Insurance	Socio-economic status, according to the type of health insurance.	Nominal	FONASA A
			FONASA B
			FONASA C
			FONASA D
			ISAPRE
			Other
Country of Origin		Nominal	Chilean
			Other
Hospital	Institutions with an organized medical staff which provide medical care to patients.	Nominal	Barros Luco
			HUAP
			Sotero del Rio
Chief complaint	The primary symptom that a patient states as the reason for seeking dental care.	Nominal	Toothache or pain in mouth
			Lost of fillingo r crown
			Dento-alveolar trauma
			Swelling in the mouth
			Other
Diagnosis*	Determination of the nature of a disease or condition made by a dentist.	Nominal	Pulp and Perical lesions
			Gingival and Periodontal conditions
			Mouth celulitis or abcess
			Disorders of teeth eruption
			Dental Trauma, tooth fracture or radicular rest
			Complication of tooth extraction
			Other
Treatment*	Procedures concerned with the care provided.	Nominal	Antibiotic prescription
			Other prescription
			Tooth extraction
			Other
Change from baseline in pain level	Pain score before treatment less pain score after treatment. Calculated as VAS score pre-treatment less VAS score post-treatment.	Discrete	Value between -100 and 100.
Pain score before care (in ten)**	Pain score before treatment.	Ordinal	Value from 0 to 100 arrange in groups of ten (i.e. 0-10, 11-20, 21-30, 31-40, 41-50, 51-60, 61-70, 71-80, 81-90 and 91-100)

Pain score after care (in ten)**	Pain score after treatment.	Ordinal	Value from 0 to 100 arrange in groups of ten (i.e. 0-10, 11-20, 21-30, 31-40, 41-50, 51-60, 61-70, 71-80, 81-90 and 91-100)
Change from baseline in oral health status	QoL score before treatment less QoL score after treatment. Calculated as DS-QoL score pre-treatment less DS-QoL score post-treatment.	Discrete	Value between -18 and 18.

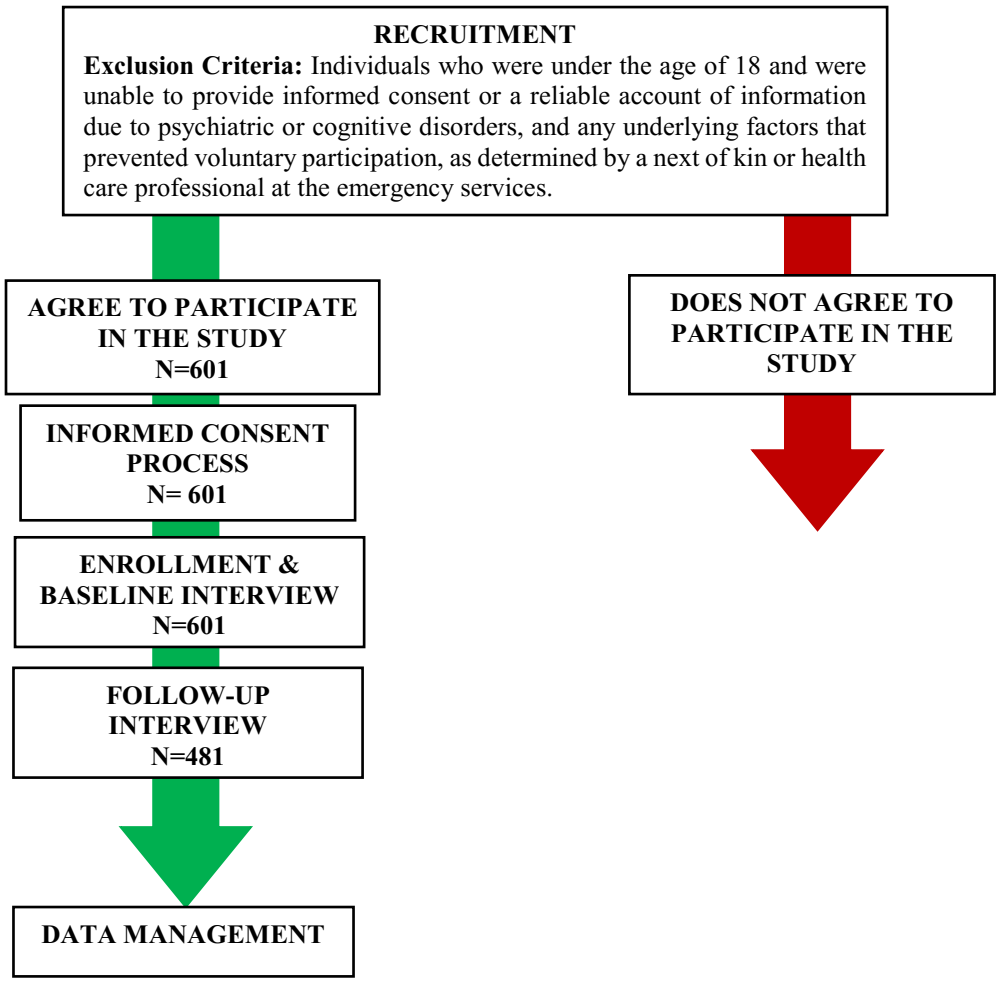
*The variables diagnosis and treatment were only collected on two hospitals (HUAP and Hospital Sotero del Rio), we were not able to collect this information for Hospital Barros Luco due to provider time constraints.

**The variables pain score before and after treatment (in ten) are categories that group score in units of ten to reflect more substantial change.

Table 2: Chilean Public insurance (FONASA) by section (27).

Section	Beneficiaries of the Section
FONASA A	Beneficiaries lacking resources to pay contributions in health, or in conditions of indigence (non-contributors).
FONASA B	Beneficiaries with incomes less than U$ 450 per month (contributors) Workers in the public health sector
FONASA C	Beneficiaries with incomes between U$ 450 and $655 per month (contributors)
FONASA D	Beneficiaries with income of U$ 656 and more per month (contributors)

Figure 2: **Participant Recruitment and Data Collection Process.**



Sample Size: To calculate the sufficient sample size, effect size was established from the data collected through a pilot study. The effect size for the level of pain was 10 points with a standard deviation of 30, and the effect size for the quality of life was 25 with a standard deviation of 100. With a power of 80%, the *n* for the level of pain was 73 and 128 for quality of life. Given that the *n* for quality of life was larger, that value was used for simple size. The expected loss to follow-up was set at 15%, resulting in a total sample of 150 patients per hospital and a total of 450 patients enrolled in the study. The study enrolled and interviewed 601 patients, 200 from each hospital.

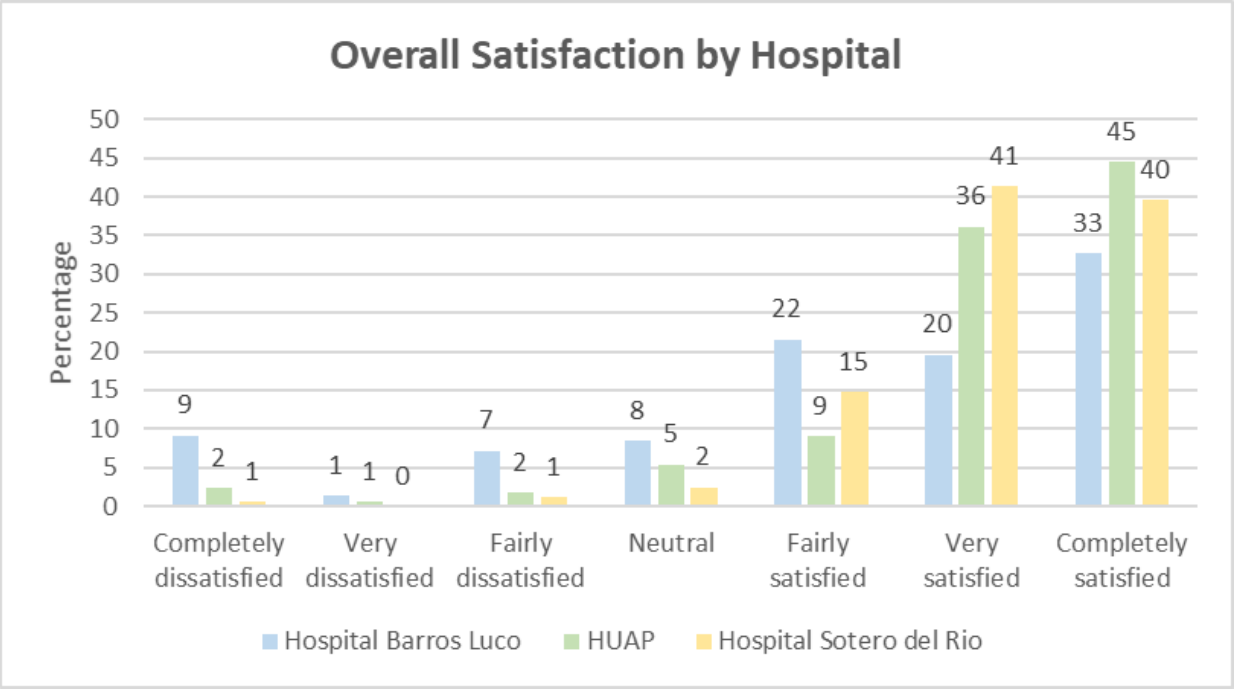
Data Management Procedures and Statistical Analysis: Data were collected during the interview using paper forms and when recording the data from the dentist questionnaire. All paper documentation was given an ID number per patient and all patient identifiers were removed. Paper documentation was scanned and electronically stored in a password protected file. Data was entered into a secure database by each interviewer. The data was stored in a password protected cloud file. All statistical analyses were performed using STATA 14. Median values for the three sections of patient satisfaction (PEQ) for the total sample and by hospital were calculated. To test if there was a difference between the level of satisfaction between hospitals, a Kruskall-Wallis test was be performed because the data was skewed data. An ordinal logistic regression model was fit for patient satisfaction and included several predictors (sex, age, pain score before and after treatment, change from baseline in pain level, change from baseline in oral health status, etc.) and was used to identify variables significantly associated with the dimensions of patient satisfaction (Overall Satisfaction, Interpersonal Satisfaction and Technical Satisfaction).

6.4 Results

In this study 481 people completed the in-person interview and follow-up phone call approximately one week later. Of the people who participated, 153 people went to Hospital Barros Luco, 166 went to Hospital de Urgencia Asistencia Publica (HUAP) and 162 went to Hospital Sotero del Rio. The Shapiro-Wilk test determined that the Overall Satisfaction scores were not normally distributed.

The median score of Overall Satisfaction was 6 (range 1- 7) for all individuals and 6 (range 1- 7), 6 (range 1- 7) and 6 (range 1- 7) for hospitals Barros Luco, HUAP and Sotero del Rio, respectively. See Figure 1 for overall satisfaction within each hospital site.

Figure 1: Percentage of patient's overall satisfaction ratings within each hospital site.



The Shapiro-Wilk test determined that the Interpersonal Satisfaction and Technical Satisfaction scores were also not normally distributed. Therefore, the median score was used as the measure of central tendency. The median score for Interpersonal Satisfaction was 30 (range 0- 35) for individuals across the three hospitals, and 28 (range 0- 35), 33 (range 27- 35) and 30 (range 13- 35) for Barros Luco, HUAP and Sotero del Rio hospitals, respectively. The median score for Technical Satisfaction was 20 (range 0- 20) for all individuals, and 18 (range 0- 20), 20 (range 3- 20), and 19 (range 8- 20) for hospitals Barros Luco, HUAP and Sotero del Rio, respectively. See Figures 2 and 3 for details about the distribution of satisfaction score for interpersonal relations satisfaction and technical competence satisfaction by hospital.

Figure 2: Percentage of patient's interpersonal satisfaction ratings within each hospital site.

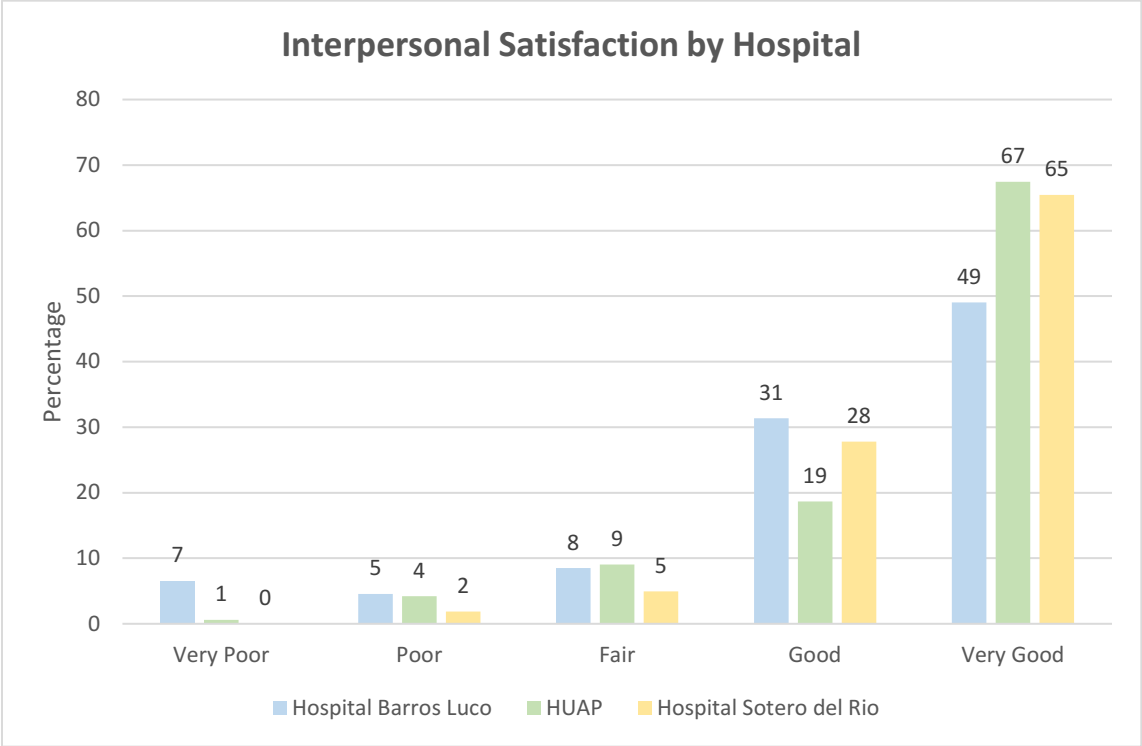
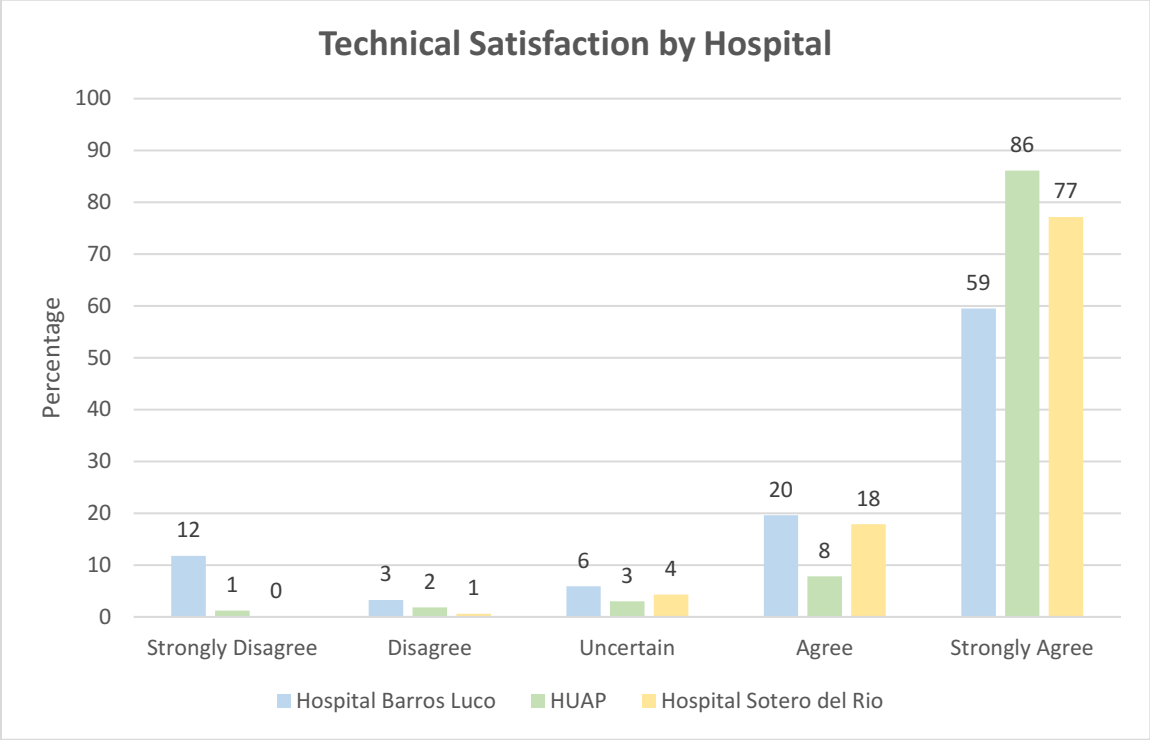


Figure 3: Percentage of patient's technical competence satisfaction ratings within each hospital site.



The Kruskal-Wallis test for the variables Overall Satisfaction, Interpersonal Satisfaction and Technical Satisfaction yielded p = 0.0001, p = 0.0048 and p = 0.0001, respectively, which showed there was a statistically significant difference in Overall Satisfaction, Interpersonal Satisfaction and Technical Satisfaction across the hospitals.

Several univariate logistic regression models were performed to identify variables associated with the satisfaction of the dental emergency services.

The univariate analysis showed that variation in Overall satisfaction was associated with the variables age, type of health insurance, hospital attended, change from baseline for pain level, pain score after care and change from baseline for oral health status (Table 3). Specifically age, patient that attended HUAP or Hospital Sotero del Rio, have higher change from baseline in pain level, and have higher change from baseline in oral health status have higher probability of being satisfied with care and people in the category other in health insurance and with have higher pain score after care have lower probability of being satisfied.

Table 3: Univariate analysis of variables associated with variation in Overall Satisfaction.

Variable	Category	β- Coefficient	Odds Ratio (95% IC)	*p*-value
Age	**In years**	0.017	1.018 (1.001, 1.029)	**0.003**
Sex	Female (reference)	1	-	-
	Male	-0.075	0.928 (0.667, 1.291)	0.657
Educational Level	Elementary School (reference)	1	-	-
	High School	-0.329	0.719 (0.440, 1.175)	0.188
	Trade School	-0.337	0.714 (0.409, 1.247)	0.236
	College	-0.463	0.629 (0.336, 1.179)	0.148
Health Insurance	FONASA A (reference)	1	-	-
	FONASA B	-0.084	0.919 (0.556, 1.520)	0.742
	FONASA C	0.068	1.069 (0.623, 1.838)	0.807
	FONASA D	-0.326	0.722 (0.447, 1.167)	0.183

	ISAPRE	0.397	1.487 (0.395, 5.597)	0.558
	Other	-0.695	0.499 (0.272, 0.915)	**0.025**
Citizenship	Chilean (reference)	1	-	-
	Other	0.249	1.282 (0.705, 2.334)	0.415
Hospital Attended	Hospital Barros Luco (reference)	1	-	-
	HUAP	0.984	2.675 (1.759, 4.065)	**<0.0001**
	Hospital Sotero del Rio	0.902	2.463 (1.630, 3.722)	**<0.0001**
Chief complaint	Other (reference)	1	-	-
	Toothache/ Pain in mouth	-0.077	0.926 (0.455, 1.886)	0.832
	Lost Filling or crown	-0.604	0.547 (0.159, 1.876)	0.337
	Dento-alveolar trauma	0.132	1.141 (0.494, 2.633)	0.757
	Swelling in mouth	-0.058	0.944 (0.285, 3.125)	0.925
Diagnosis	Other (reference)	1	-	-
	Pulp and Periapical lesions	0.367	1.443 (0.576, 3.614)	0.433
	Gingival and Periodontal conditions	0.188	1.207 (0.500, 2.913)	0.675
	Mouth cellulitis or abscess	0.205	1.228 (0.378, 3.984)	0.733
	Disorders of teeth eruption	-0.268	0.765 (0.276, 2.119)	0.606
	TDA or Tooth fracture or RR	0.444	1.558 (0.463, 5.242)	0.473
	Complication of tooth extraction	-0.010	0.989 (0.281, 3.477)	0.987
Treatment	Other (reference)	1	-	-
	Antibiotic prescription	0.413	1.042 (0.345, 3.145)	0.942
	Other prescription	-0.156	0.855 (0.304, 2.403)	0.767
	Tooth extraction	0.614	1.847 (0.733, 4.653)	0.193
Change from baseline in pain level	Pain score before treatment less pain score after treatment	0.010	1.010 (1.005, 1.015)	**<0.0001**
Pain score before care (in ten)	Value from 0 to 100 arrange in groups of ten.	0.011	1.011 (0.953, 1.071)	0.723
Pain score after care (in ten)	Value from 0 to 100 arrange in groups of ten.	-0.326	0.722 (0.653, 0.797)	**<0.0001**
Change from baseline in oral health status	QoL score before treatment less QoL score after treatment	0.136	1.145 (1.091, 1.203)	**<0.0001**

Note: Bold entry signifies statistical significance (i.e. $p<0.05$).

The univariate analysis showed that variation in Interpersonal satisfaction was associated with the variables hospital attended, change from baseline for pain level, pain score after care and change from baseline for oral health status (Table 4). Respectively patient that attended HUAP or Hospital Sotero del Rio, have higher change from baseline in pain level, and have higher change from baseline in oral health status have higher probability of being satisfied with care and people with higher pain score after care have lower probability of being satisfied.

Table 4: Univariate analysis of variables associated with variation in Interpersonal Satisfaction.

Variable	Category	β- Coefficient	Odds Ratio (95% IC)	*p*-value
Age	In years	0.002	1.002 (0.989, 1.015)	0.740
Sex	Female (reference)	1	-	-
	Male	0.016	1.016 (0.708, 1.458)	0.932
Educational Level	Elementary School (reference)	1	-	-
	High School	-0.405	0.667 (0.388, 1.146)	0.143
	Trade School	-0.298	0.742 (0.399, 1.378)	0.345
	College	0.166	1.181 (0.578, 2.414)	0.649
Health Insurance	FONASA A (reference)	1	-	-
	FONASA B	0.127	1.135 (0.650, 1.981)	0.656
	FONASA C	-.0133	0.876 (0.501, 1.531)	0.641
	FONASA D	-0.124	0.883 (0.523, 1.488)	0.641
	ISAPRE	-0.286	0.751 (0.199, 2.824)	0.672
	Other	-0.257	0.773 (0.397, 1.507)	0.450
Citizenship	Chilean (reference)	1	-	-
	Other	0.515	1.674 (0.819, 3.419)	0.157
Hospital Attended	Hospital Barros Luco (reference)	1	-	-
	HUAP	0.746	2.108 (1.356, 3.276)	**0.001**
	Hospital Sotero del Rio	0.767	2.154 (1.393, 3.332)	**0.001**
Chief complaint	Other (reference)	1	-	-
	Toothache/ Pain in mouth	0.078	1.081 (0.500, 2.335)	0.843
	Lost Filling or crown	-0.206	0.814 (0.209, 3.169)	0.767
	Dento-alveolar trauma	0.225	1.252 (0.493, 3.181)	0.636
	Swelling in mouth	-0.082	0.921 (0.239, 3.537)	0.905

Diagnosis	Other (reference)	1	-	-
	Pulp and Periapical lesions	0.138	1.148 (0.418, 3.149)	0.789
	Gingival and Periodontal conditions	0.140	1.150 (0.436, 3.036)	0.777
	Mouth cellulitis or abscess	-0.079	0.923 (0.255, 3.347)	0.903
	Disorders of teeth eruption	0.151	1.163 (0.375, 3.601)	0.794
	TDA or Tooth fracture or RR	0.257	1.294 (0.326, 5.127)	0.714
	Complication of tooth extraction	0.143	1.153 (0.261, 5.095)	0.851
Treatment	Other (reference)	1	-	-
	Antibiotic prescription	0.205	1.228 (0.352, 4.287)	0.748
	Other prescription	-0.386	0.679 (0.218, 2.121)	0.506
	Tooth extraction	0.417	1.517 (0.537, 4.289)	0.432
Change from baseline in pain level	Pain score before treatment less pain score after treatment	0.007	1.001 (1.001, 1.012)	**0.016**
Pain score before care (in ten)	Value from 0 to 100 arrange in groups of ten.	-0.028	0.972 (0.911, 1.037)	0.396
Pain score after care (in ten)	Value from 0 to 100 arrange in groups of ten.	-0.274	0.760 (0.686, 0.842)	**<0.0001**
Change from baseline in oral health status	QoL score before treatment less QoL score after treatment	0.119	1.126 (1.069, 1.186)	**<0.0001**

Note: Bold entry signifies statistical significance (i.e. $p<0.05$).

The univariate analysis showed that variation in Technical satisfaction were associated with the variables hospital attended, type of treatment, change from baseline in pain level, pain score after care and change from baseline in oral health status (Table 5). Explicitly patient that attended HUAP or Hospital Sotero del Rio, patient that received tooth extraction, have higher change from baseline in pain level, and have higher change from baseline in oral health status have higher probability of being satisfied with care and people with higher pain score after care have lower probability of being satisfied.

Table N°5: Univariate analysis of variables associated with variation in Technical Satisfaction.

Variable	Category	β- Coefficient	Odds Ratio (95% IC)	*p*-value
Age	In years	0.008	1.008 (0.994, 1.023)	0.267
Sex	Female (reference)	1	-	-
	Male	0.338	1.402 (0.919, 2.138)	0.116
Educational Level	Elementary School (reference)	1	-	-
	High School	-0.355	0.701 (0.373, 1.319)	0.271
	Trade School	-0.045	0.956 (0.458, 1.992)	0.904
	College	-0.221	0.802 (0.362, 1.776)	0.586
Health Insurance	FONASA A (reference)	1	-	-
	FONASA B	-0.259	0.772 (0.431, 1.384)	0.385
	FONASA C	0.537	1.710 (0.854, 3.426)	0.130
	FONASA D	0.155	1.168 (0.646, 2.114)	0.608
	ISAPRE	0.164	1.178 (0.231, 6.003)	0.844
	Other	0.145	1.156 (0.524, 2.552)	0.719
Citizenship	Chilean (reference)	1	-	-
	Other	0.694	2.003 (0.822, 4.88)	0.126
Hospital Attended	Hospital Barros Luco (reference)	1	-	-
	HUAP	1.505	4.506 (2.619, 7.755)	**<0.0001**
	Hospital Sotero del Rio	0.963	2.620 (1.619, 4.239)	**<0.0001**
Chief complaint	Other (reference)	1	-	-
	Toothache/ Pain in mouth	-0.218	0.803 (0.319, 2.025)	0.643
	Lost Filling or crown	-1.127	0.324 (0.078, 1.353)	0.122
	Dento-alveolar trauma	-0.267	0.766 (0.261, 2.252)	0.628
	Swelling in mouth	-0.193	0.824 (0.171, 3.965)	0.810
Diagnosis	Other (reference)	1	-	-
	Pulp and Periapical lesions	0.151	1.162 (0.295, 4.587)	0.830
	Gingival and Periodontal conditions	-0.457	0.633 (0.174, 2.303)	0.488
	Mouth cellulitis or abscess	-0.582	0.559 (0.114, 2.734)	0.473
	Disorders of teeth eruption	-0.123	0.884 (0.195, 4.001)	0.873
	TDA or Tooth fracture or RR	1.050	2.858 (0.268, 30.515)	0.385

	Complication of tooth extraction	0.842	2.320 (0.215, 25.061)	0.488
Treatment	Other (reference)	1	0	0
	Antibiotic prescription	0.526	1.692 (0.429, 6.669)	0.452
	Other prescription	-0.373	0.689 (0.213, 2.232)	0.534
	Tooth extraction	1.164	3.202 (1.052, 9.745)	**0.040**
Change from baseline in pain level	Pain score before treatment less pain score after treatment	0.009	1.009 (1.003, 1.045)	**0.003**
Pain score before care (in ten)	Value from 0 to 100 arrange in groups of ten.	-0.070	0.932 (0.864, 1.005)	0.067
Pain score after care (in ten)	Value from 0 to 100 arrange in groups of ten.	-0.422	0.656 (0.588, 0.731)	**<0.0001**
Change from baseline in oral health status	QoL score before treatment less QoL score after treatment	0.115	1.122 (1.057, 1.191)	**<0.0001**

Note: Bold entry signifies statistical significance (i.e. p<0.05).

The multivariable logistic regression model for Overall Satisfaction was constructed adding all six variables that presented statistically significative difference in the univariable linear regression; the variables were age, type of health insurance, hospital attended, change from baseline for pain level, pain score after care and change from baseline for oral health status (Table 6).

Table 6: Multivariate analysis of variables associated with variation of Overall Satisfaction.

Variable	Category	β- Coefficient	Odds Ratio (95% IC)	*p*-value
Age	In years	0.0169	1.017 (1.004, 1.029)	**0.006**
Health Insurance	FONASA A (reference)	1	-	-
	FONASA B	-0.300	0.740 (0.440, 1.245)	0.257
	FONASA C	-0.076	0.927 (0.528, 1.626)	0.791
	FONASA D	-0.622	0.537 (0.324, 0.889)	**0.016**
	ISAPRE	0.184	1.202 (0.323, 4.481)	0.784
	Other	-0.701	0.496 (0.267, 0.923)	**0.027**
Hospital Attended	Hospital Barros Luco (reference)	1	-	-
	HUAP	0.990	2.692 (1.730, 4.189)	**<0.0001**
	Hospital Sotero del Rio	1.011	2.750 (1.768, 4.279)	**<0.0001**

Change from baseline in pain level	Pain score before treatment less pain score after treatment	-0.001	0.999 (0.991, 1.005)	0.665
Pain score after care (in ten)	Value from 0 to 100 arrange in groups of ten.	-0.238	0.788 (0.699, 0.889)	**<0.0001**
Change from baseline in oral health status	QoL score before treatment less QoL score after treatment	0.131	1.140 (1.071, 1.213)	**<0.0001**

Note: Bold entry signifies statistical significance (i.e. p<0.05).

The multivariable logistic regression model for Interpersonal Satisfaction was constructed adding all four variables that presented statistically significative difference in the univariable linear regression; the variables were variables hospital attended, pain score after care and change from baseline in oral health status (Table 7).

Table 7: Multivariate analysis of variables associated with variation of Interpersonal Satisfaction.

Variable	Category	β- Coefficient	Odds Ratio (95% IC)	*p*-value
Hospital Attended	Hospital Barros Luco (reference)	1	-	-
	HUAP	0.648	1.912 (1.219, 3.000)	**0.005**
	Hospital Sotero del Rio	0.853	2.347 (1.495, 3.683)	**<0.0001**
Change from baseline in pain level	Pain score before treatment less pain score after treatment	-0.006	0.993 (0.986, 1.000)	0.082
Pain score after care (in ten)	Value from 0 to 100 arrange in groups of ten.	-0.249	0.779 (0.687, 0.885)	**<0.0001**
Change from baseline in oral health status	QoL score before treatment less QoL score after treatment	0.113	1.119 (1.049, 1.195)	**0.001**

Note: Bold entry signifies statistical significance (i.e. p<0.05)

The variables found that presented statistically significative difference in the univariable logistical regression for Technical Satisfaction were hospital attended, treatment received, change from baseline in pain level, pain score after care and change from baseline in oral health status. Due that variable treatment received was only available for two of the three hospital sites we constructed

two multivariable linear regression models. The first model was constructed with the variables hospital attended, change from baseline in pain level, pain score after care and change from baseline in oral health status, that were available for all patients with follow-up (Table 8).

Table 8: Multivariate analysis of variables associated with variation in Technical Satisfaction.

Variable	Category	β- Coefficient	Odds Ratio (95% IC)	*p*-value
Hospital Attended	Hospital Barros Luco (reference)	1	-	-
	HUAP	1.448	4.256 (2.419, 7.489)	**<0.0001**
	Hospital Sotero del Rio	1.058	2.879 (1.735, 4.781)	**<0.0001**
Change from baseline in pain level	Pain score before treatment less pain score after treatment	-0.008	0.992 (0.983, 1.000)	0.056
Pain score after care (in ten)	Value from 0 to 100 arrange in groups of ten.	-0.462	0.630 (0.544, 0.730)	**<0.0001**
Change from baseline in oral health status	QoL score before treatment less QoL score after treatment	0.060	1.062 (0.988, 1.142)	0.104

Note: Bold entry signifies statistical significance (i.e. p<0.05)

The second model was constructed with all five variables that presented statistically significative difference in the univariable logistical regression for Technical Satisfaction, those were hospital attended, treatment received, change from baseline in pain level, pain score after care and change from baseline in oral health status (Table 9).

Table 9: Multivariate analysis of variables associated with variation in Technical Satisfaction.

Variable	Category	β- Coefficient	Odds Ratio (95% IC)	*p*-value
Hospital Attended	HUAP (reference)	1	-	-
	Hospital Sotero del Rio	-0.071	0.931 (0.476, 1.823)	0.835
Treatment*	Other (reference)	1	-	-
	Antibiotic prescription	0.478	1.613 (0.385, 6.764)	0.513
	Other prescription	-0.311	0.732 (0.385, 6.764)	0.627
	Tooth extraction	1.06	2.896 (0.915, 9.161)	0.070

Change from baseline in pain level	Pain score before treatment less pain score after treatment	-0.004	0.996 (0.984, 1.008)	0.489
Pain score after care (in ten)	Value from 0 to 100 arrange in groups of ten.	-0.416	0.659 (0.536, 0.811)	**<0.0001**
Change from baseline in oral health status	QoL score before treatment less QoL score after treatment	0.062	1.064 (0.944, 1.200)	0.308

Note: Bold entry signifies statistical significance (i.e. $p<0.05$);
*Variable treatment only available for two hospitals (HUAP and Sotero del Rio)

6.5 Discussion

This study examined the satisfaction of care received by patients attending a dental emergency service clinic at one of three hospitals in Santiago, Chile. Overall, the majority of patients (over 80%) were completely or very satisfied with their dental experience including their overall satisfaction, their interpersonal satisfaction, and their technical satisfaction. This is similar to what other studies on satisfaction of care within dental emergency services have found (26, 28-31). The high levels of satisfaction can be explained in two ways. First, studies have shown that unless the care is below the level of what patients believe is an adequate health service, they will rate the care as satisfactory (32-34). Second, satisfaction is related to fulfilment of patient expectations (34) and the expectation for dental emergency services are:

- The services should exist and be accessible, and
- The services should provide relief of the symptoms and provide a greater certainty regarding the cause of their problem (35).

Also, it is important to mention that patients ultimately judge the quality of services on their perceptions of the technical outcome and how that outcome was delivered (22) and level of expectation diminishes when a patient is in pain (19).

When several univariate logistic regression models were fit to identify variables associated with the overall satisfaction of the dental emergency services, six variables showed association with the overall satisfaction: age, type of health insurance, hospital attended, change from baseline in pain level, pain score after treatment and change from baseline in oral health status. This isn't surprising since age and health insurance have been shown to be determinants of satisfaction (15); age has been shown to be related to perception of satisfaction (17) and in this study, type of health insurance was used as proxy of economic status or social class, which is also related to perception of satisfaction (15, 17). It is unexpected that the variable hospital attended is associated with level of overall satisfaction; currently we are uncertain why this is and recommend a qualitative follow-u study to find the cause. The variables change from baseline in pain level, pain score after treatment and change from baseline in oral health status are related to relief of symptoms, specifically pain (13, 22, 35), and this is one of the main expectations of patients when attending dental emergency services. Thus, it makes sense that they will be associated with level of satisfaction. In the multivariate analysis with all six significant factors from univariate analysis entered simultaneously, it was found that age, health insurance, hospital attended, pain score after treatment and change from baseline in oral health status were independent factors for level of overall satisfaction.

When several univariate logistic regression models were fit to identify variables associated with the interpersonal satisfaction of the dental emergency services, four variables showed association with the interpersonal satisfaction, those variables were hospital attended, change from baseline in pain level, pain score post attention and change from baseline in oral health status. It is unexpected that the variable hospital attended is associated with level of interpersonal satisfaction. This suggests some difference across hospitals, and we recommend conducting a follow-up qualitative

study to find the cause. One interpretation is the variable pain score after treatment is associated with level of satisfaction because the factors that patients consider important in interpersonal communication are: care, attention, “pain control”, “dentist put you at ease” and “safety conscious” (17). The association of the variable change from baseline in pain level and quality of life and interpersonal satisfaction could be that diminished level of pain and gain in quality of life improve the attitude of the patients and therefore they tend give a better evaluation of quality of care.

When several univariate logistic regression models were fit to identify variables associated with the technical satisfaction of the dental emergency services, five variables showed association with the interpersonal satisfaction: hospital attended, treatment received, change from baseline in pain level, pain score post-attention and change from baseline in oral health status. Four of these variables are the same variables that were association with interpersonal satisfaction. This could be due to the fact that it is difficult for patients to evaluate technical quality and usually form their impressions of the services from a number of other cues (17). It was unexpected that the variable hospital attended is associated with level of technical satisfaction and we again recommend performing a qualitative study. One interpretation with the association of the variables change from baseline in pain level pain score post-attention, change from baseline in oral health status and treatment to level of satisfaction is because all of these variables are a reflection of outcome of care and this is one of the dimensions that patients use to evaluate satisfaction (15). Moreover, for the patient, technical skills involve the ability to relieve the dental problem and minimize pain (36) . In the first multivariate analysis with four significant factors from univariate analysis entered simultaneously, it was found that only the variables hospital attended and pain score post-attention were independent factors for level of technical satisfaction. In the second multivariate analysis

with all five significant factors from univariate analysis entered simultaneously, it was found that only pain score post-attention was an independent factor for level of technical satisfaction.

On potential limitation is that the follow-up method may artificially increase the satisfaction level as patients who completed the follow-up interview may have reported higher level of satisfaction because the follow-up phone call made them feel that the hospital cared about their progress (33). A second limitation is not including other variables that affect level of satisfaction such as previous experiences in dental emergency, differentiation between regular and irregular users and level of dental anxiety (17). It may have been beneficial to add a question about the willingness to recommend the hospital as a measure of satisfaction (37). A third limitation is that this study is mainly quantitative, and it has been demonstrated that people are generally more critical of health services in qualitative research (34). Lastly, it is important to consider the timing of the satisfaction measure. It has been determined that this information should be collected no later than 42 days after treatment (38). Our post-treatment data collection did stay within this time frame, but it may be that conducting a survey about satisfaction immediately after care receipt and do it again some days after would allow to compare if there is a change in patient satisfaction depending the time of the measure.

6.6 Conclusion

Although the care received by patients seeking dental emergency services was highly satisfactory, dental care satisfaction varied across the three study hospitals. It is unknown to what the difference across hospital is due and it would be advisable to do a qualitative study to find some potential reason. All types of satisfaction (overall satisfaction, interpersonal satisfaction and technical association) were associated to four variables; hospital attended, change from baseline in pain level, pain score after treatment and change from baseline in oral health status, meaning that this four

variables are key to determine patient satisfaction and should be watched closely to insure high patient satisfaction with dental emergency services.

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7. Chapter 6: General Discussion

The findings previously described in this dissertation bring a glance to dental emergency services provided at several hospitals in Santiago, Chile. Using a short-term before-after study, patients' utilization of emergency services, their perceived effectiveness of care as measured by pain relief and oral health status, and their resulting satisfaction with their care was examined. Chapter three presented the demographic and clinical characteristics of patients who sought emergency dental care at the three hospital sites. Chapters four and five presented the quality of care dimensions, effectiveness of and patient satisfaction with received services. In summary, these findings showed that the bulk of patients seeking emergency dental services were middle-aged adults with health insurance for emergency visits that typically did not extend to coverage for routine dental care, that their treatment was effective in relieving reported dental pain and improving their oral health quality of life, and that they were highly satisfied with the care received.

Our study findings show that the users of dental emergency services were mostly middle-aged adults, female (57%), with a high school diploma (49%) or higher (36%), with public health insurance (88%) and Chilean citizenship (91%). Almost eighty percent of the participants' chief complaint was toothache/pain in their mouths. This study's dental emergency user characteristics were similar to another study of dental emergency utilization in Chile by Bucchi (1) and it's similar in age and sex distribution with U.S. (2) and Canadian (2) studies. We can conclude that globally the utilizers of dental emergency services are mostly adults, given that they have no (or a reduced level) of dental coverage compared to children, and use of services are fairly distributed between males and females compared to routine healthcare services access where women have a higher utilization (3).

Our study findings showed that the chief complaint for dental emergency utilizers was toothache/ pain in the mouth (79%), followed by dento-alveolar trauma (11%); this is similar to studies from other countries (1, 4, 5). It is likely that pain was the primary driver for seeking dental emergency services, although this may vary according to the type of insurance coverage and access to routine dental care of each country. Based on the clinicians' report the main diagnosis for patients' chief complaint in our study was gingival and periodontal conditions (39%), followed by pulp and periapical lesions (28%) and disorders of teeth eruption (11%); main diagnosis of the dental condition that prompted the emergency dental visit varied widely across studies and countries (2, 5-7). One explanation for this discrepancy may be the lack of standardized diagnostic terminology in dentistry (8), this poses the problem that each clinician and study author may be using a slightly different diagnostic schema which can make comparison across settings, sites, and countries difficult. In the current study, care provided during the emergency visit was examined. The main treatment provided was tooth extraction (71%), followed by other prescription (12.5%) and antibiotic prescription (9%); compared to other studies examining emergency dental utilization, only two other studies described treatment given during the dental emergency visit (1, 9). However, it is clear that treatment may be hospital- and health professional-dependent.

For measurement purposes healthcare quality has been defined by six dimensions; safe, acceptable for the patient, timely, effective, efficient and equitable (IOM (10), Maxwell (11)). For the current study we chose the dimensions of effectiveness and acceptability, also referred to as patient satisfaction, because those dimensions reflected whether dental emergency services worked from the individual patient perspective. We found that the dental emergency services provided were effective in relieving patients' pain and improving their oral health-related quality of life. Almost all of the patients reported considerable or total pain relief after seeking care at the hospital's dental

emergency services. Furthermore, most of the patients showed an improvement in perceived oral health-related quality of life. Overall, even though the hospital sites were effective in improving patients' perceived quality of life some hospitals were more effective than others. This study also examined factors potentially associated with the effectiveness of care received (i.e., reduction in pain and/or perceived oral health quality of life). Factors that were associated with pain relief after treatment were type of health insurance, chief complaint and diagnosis. We think that chief complaint is associated with pain relief and improved quality of life as patients whose chief complaint was pain-driven may have been more sensitive to any treatment changes. Factors associated with improved oral health quality of life were hospital attended, chief complaint and diagnosis. It was surprising to find the relationship between oral health quality of life and the hospital attended and we are not sure the reason for this. We anticipate exploring this relationship further in a subsequent study.

The majority of patients (over 80%) were completely or very satisfied with their dental experience based on the three types of satisfaction measured in this study (e.g., overall satisfaction, interpersonal satisfaction, and technical satisfaction). This is similar to other studies which have reported on satisfaction of care within dental emergency services (1, 12-15). It was somewhat surprising to find such high patient satisfaction ratings within a hospital dental emergency services setting. It would be interesting to compare patients' satisfaction with emergency dental services across other settings (i.e., private practices, community care centers) to determine if this phenomenon is due to the specific expectation within emergency services or due to particular characteristics of the healthcare settings studied. It is important to highlight that overall most patients were satisfied with the care they received, however, there was variability in level of satisfaction across the three hospitals.

In the current study, the factors associated with level of satisfaction varied depending on the dimension of satisfaction measured. Factors associated with overall satisfaction were age, type of health insurance, hospital attended, change from baseline in pain level, pain score after care and change from baseline in oral health status. The factors associated with interpersonal satisfaction were hospital attended, change from baseline in pain level, pain score after care and change from baseline in oral health status. And lastly, the factors associated with technical satisfaction were hospital attended, treatment, change from baseline in pain level, pain score after care and change from baseline in oral health status.

Due to time and budget constraints this study only examined dental attendance at three hospital sites in Santiago, Chile resulting in slightly over 600 recruited patients. While the sample size was adequate for the statistical analyses performed it would be beneficial to conduct a larger study which would include more and different health care settings to provide a more accurate picture of dental attendance and perceived health care quality to health care providers, policymakers and government administrators. Nonetheless, this study showed that in Chile while there continues to be an unmet need of routine access to dental care for the adult population, patients who have sought care through hospital dental emergency services felt satisfied that they received effective care.

Future Direction and Next Steps

This dissertation provided an updated profile of the people that access dental emergency services in Santiago, Chile. It also addressed a gap of knowledge with respect to quality of dental emergency services, specifically in the dimensions of effectiveness and satisfaction. Although it is only a first approach toward understanding health care quality in Chilean dental emergency services it lays a foundation for future studies. Next steps for further study, which merit consideration, include the following series of questions; 1) Why are so many people attending

dental emergency services?; 2) Is the Chilean healthcare system adequately addressing all of the oral health needs of the population? And if not, why?; 3) Is the overall Chilean health care system providing quality services per the multidimensional concept of quality?; 4) Are the healthcare services provided effective for all patients?; 5) Are all patients satisfied with the care received? 6); What intrinsic and extrinsic factors influence patient satisfaction?; 7) Are the patient population's needs being met? And if not, why?; and 8) How can dental care services be improved to elevate health care quality?

Some changes necessary to improve future research pursuits in the healthcare quality area are:

- Establishing and standardizing measures for each dimension of quality for dental care services.
- Implementing standardized terminology for dental diagnosis and treatments.
- Promoting use of patient-centered outcomes to measure quality of care.
- Advocating for health care system implementation of a continuous quality improvement cycle process.

These findings are just the beginning of our understanding of healthcare quality of emergency dental care services in Chile. Future research on dental care services should be expand quality and effectiveness studies across various dental settings (i.e. community health centers, specialty centers, etc.) to establish quality rates of each one and determine a baseline.

7.1 References

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8. Chapter 7: Conclusion

Overall, this study found that dental emergency services provided to study participants at the three Chilean hospital sites were effective in pain relief and improvement of oral health-related quality of life. Furthermore, most patients were satisfied with their care experience. Even though the care provided was effective and patients felt satisfied with the care they received, some hospitals were more effective in improving their patients' oral health-related quality of life and providing more satisfaction than others.

I hope this study will encourage further research in examining the quality of care provided to patients in hospital dental emergency services in Chile and to potentially broaden to general dental services, especially those services provided by government sites that use tax payer money Additionally, I expect the results of this study will highlight the great work that is being done by clinicians in the dental emergency service department with high demand and limited resources. Although this study found that patients seen in a hospital dental emergency service in Chile experienced reduction in pain, improved oral health-related quality of life, and were generally satisfied, it is imperative not to lose sight of the high demand for acute dental services. Future work should explore the reason(s) for the high demand of dental emergency services and take steps to reduce the gap between the need for and access to oral health that produces this high demand.

9. Appendixes

9.1 Appendix 1: Pre-survey

9.2 Appendix 2: Post-survey

9.3 Appendix 3: Dentist form