

SLEEP DISORDERS TREATMENT SURVEY

A Thesis

by

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ABSTRACT

Even though the Association of Sleep Disorders Center was founded in 1976, sleep medicine wasn't considered a specialty until 1996. The United States population has undergone a 20% decrease in sleep time over the past century, with a concurrent increase in reported sleep disorders. Sleep disorders are similar to the "silent killer" heart disease in that they frequently go undiagnosed. While personal health can be affected by sleep disorders, there is also a risk to third parties. Big trucks are responsible for 4,000 fatalities yearly, and 28% of commercial driver's license (CDL) drivers have diagnosed sleep apnea. A government passed bill HR3095 regulates physical exams required by CDL drivers. A licensed CDL driver now has to be seen by a medical examiner registered by the National Registry of Certified Medical Examiners to be eligible to drive once diagnosed with a sleep disorder. Several treatments are offered to alleviate the symptoms of sleep disorders. The standard form of treatment requires patients to wear devices that often result in low compliance. However, it is unclear what types of treatments patients try, and whether they eventually find a treatment that works to alleviate their symptoms.

This study was performed on 86 subjects to obtain a census of what treatments people who had been diagnosed with sleep disorders used to alleviate their symptoms. There are no current cures for sleep disorders but the symptoms can be managed. This survey assesses patient knowledge and where they acquired their information about sleep disorders and treatment, which treatments were used, what symptoms were

experienced, and quality of life issues. The majority of subjects acquired their information about sleep disorders from their dentists, sleep physician, family doctor, family/friends and the internet (94%). Over 76% of the subjects stated that they had sleep disordered breathing symptoms for 6 years or more. There were several modalities of treatments used; nonsurgical, surgical and pharmacological. The two preferred treatments of choice were continuous positive airway pressure (CPAP) machines and adjustable oral appliances (aOA). Subjects used aOA (80.2%) more often than CPAP (11.6%). Mann Whitney U-tests showed significantly fewer traveling difficulties and less interference with their quality of life with aOA than CPAP use. There was significant improvement after treatment in snoring, fatigue, and feeling refreshed in the morning regardless of treatment modality.

DEDICATION

I would like to dedicate this paper to my children, Sydney and Trévon, for hanging tough on this rough ride. I would like to thank all my family and friends for listening to me whine and complain the whole way. And they still love me. None of this would have been possible without my Lord and Savior Jesus Christ; with his grace all things are possible.

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I would like to thank all my committee members; they were a compliment to each other and provided what I needed to finish this project. Each one of them knew just what to pull out of me at the right time. Thank you all for caring enough to take the time to work with me.

NOMENCLATURE

AASM=	American Academy of Sleep Medicine
AADSM=	American Academy of Dental Sleep Medicine
AF=	Atrial Fibrillation
AHI=	Apnea Hypopnea Index
aOA=	Adjustable Oral Appliance
ASDC=	Association of Sleep Disorders Center
ANC=	Adjusted Neck Circumference
BiPAP=	Bi-level Positive Airway Pressure
BMI=	Body Mass Index
CDL=	Commercial Driver's License
CEU=	Continuing Education Credits
CompSAS=	Mixed /Complex Sleep Apnea
CPAP=	Continuous Positive Airway Pressure
CSA=	Central Sleep Apnea
DOT=	Department of Transportation
FMSCA=	Federal Motor Carrier Safety Administration
HST=	Home Sleep Test
ICSD=	International Classification of Sleep Disorders
MAD=	Mandibular Advancement Devices
NRCME=	National Registry of Certified Medical Examiners
OSA=	Obstructive Sleep Apnea

PSG=	Polysomnogram
RDI=	Respiratory Disturbance Index
RERA=	Respiratory Effort Related Arousals
SAQLI (QOL)=	Sleep Apnea Quality of Life Index or Quality Of Life
SDB=	Sleep Disordered Breathing
UARS=	Upper Airway Resistance Syndrome
UPPP=	Uvulopalatopharyngoplasty
UTHSC=	University of Tennessee Health Science Center College of Dentistry

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CHAPTER I

INTRODUCTION AND LITERATURE REVIEW

1.1 Background and Significance

The Association of Sleep Disorders Center (ASDC) was founded in 1976, but the American Medical Association did not recognize sleep medicine as a specialty until 1996 [1]. Sleep disorders have been recorded as far back as ancient Egypt. Therefore, sleep disorders are not a new condition; the medical community has recognized the need for this condition to be described and treated [1].

The 1993 report of the National Commission on Sleep Disorders research has estimated that the total sleep time for the United States population has decreased by 20% over the past century [2, 3]. The first clinically significant report of symptoms of chronic daytime sleepiness was made in 1965[2, 4]. As part of its effort to improve the nation's health, the United States government has developed the Dietary Guidelines for Americans and the Physical Activity Guidelines for Americans. The American Academy of Sleep Medicine (AASM) and the Sleep Research Society promote the daily guidelines developed by the government for healthy living [3]. For example the Dietary Guidelines for Americans in conjunction with the American Heart Association suggest a daily intake of sodium of 1500mg or less for African- Americans and those with hypertension, diabetes, and chronic kidney disease [5]. The Physical Activity Guidelines for Americans suggest an adult should participate in at least 150 minutes of moderate-intensity aerobic activity, 75 minutes of vigorous-intensity aerobic activity, or a

combination weekly [6]. To have the energy to accomplish the suggested exercise Americans have to get enough sleep.

The AASM and the Sleep Research Society have developed a document “Sleep: a health imperative” to educate the nation on the importance of adequate sleep [3]. The Institute of Medicine estimates that 50 to 70 million adult Americans have some type of chronic sleep disorder that contributes to poor health [3]. Broad societal changes; including longer work hours, which leads to longer commutes and increasing dependency on technology has also contributed to growing sleeping deficiency[3]. Over the past 20 years the percentage of men and women sleeping less than 6 hours per night has increased significantly [3].Therefore, researchers have come to realize that sleep-disordered breathing is a primary contributor to the decrease in sleep time. While the ability to recognize, treat, and identify such disorders has improved, there is still a need for further advances.

1.2 Classifications of Sleep Disorders

In order to recognize sleep disorders the basics of sleep disorders should be understood. There are three categories of sleep-disordered breathing (SDB), snoring, upper airway resistance syndrome and sleep apnea syndrome. There are 3 types of sleep apnea: central sleep apnea (CSA), mixed/complex sleep apnea (CompSAS) and Obstructive Sleep Apnea (OSA) [7]. Central sleep apnea is the cessation of air flow without respiratory effort[8](Malhotra & Owens, 2010)[8]. In CSA the brain fails to tell

the respiratory muscles to facilitate breathing. CSA is usually associated with serious illness and damage to the lower brainstem. Mixed or complex apnea (CompSAS) is a combination of central sleep apnea and obstructive sleep apnea. CompSAS describes patients with obstructive sleep apnea that is complicated by central sleep apnea tendencies[8]. These tendencies manifest themselves as Cheyne-Stokes breathing (increased respiratory effort) when the patient is on a CPAP machine[8]. The etiology for this syndrome is unclear, but it is thought to be predominantly a derangement of respiratory control coexisting with upper airway obstruction [7]. Obstructive sleep apnea is the most common form of sleep apnea. OSA is a condition where there is a cessation of breathing for 10 or more seconds (apnea) and/or the inability to take a full effective breath (hypopnea) while sleeping[9]. Apnea and hypopnea have been shown to be caused by various types of upper airway obstructions.

The accepted theory has been that sleep apnea primarily affects obese middle aged men over 50. It is now realized that women and younger people are also susceptible to sleep apnea and sleep disorders. More often than not, the disease manifests itself in women as upper airway resistance syndrome. The latest statistics report that sleep apnea is a major public health problem that affects 9% of women and 24% of men between the ages of 30 and 60[10].

Upper airway resistance syndrome (UARS) is a sleep disorder characterized by upper airway resistance due to the lack of muscle tone and narrowing of the airway, limiting air flow on inspiration during sleep[11]. The primary symptoms are daytime sleepiness and excessive fatigue. UARS has the same physical manifestations as OSA;

the difference is that people who have upper airway resistance rarely have apnea [12]. People with UARS have hypopnea which is the inability to take an effective breath while sleeping. The hypopnea leads to an increased work of breathing and therefore leads to fatigue and sleepiness[13].

Snoring is a common condition that can affect anyone, conservatively 20-57% of the population[14]. It usually occurs more in men and people who are overweight.[15]. Snoring occurs when the flow of air through the mouth and nose is physically obstructed[15]. Air flow can be obstructed by many factors: obstructed nasal airways, poor muscle tone in the throat and tongue , bulky throat tissue due to obesity, and long soft palate and/or uvula[15].

1.3 Diagnosis of Sleep Disorders

There are a wide range of health care professionals who can diagnose SDB. Often it is the family physician who notes some of the indicators for sleep apnea and they may then refer patients to a sleep lab for a sleep study. Pulmonologists, who specialize in breathing and lungs, may also diagnose sleep apnea. Sleep physicians who specialize in sleep medicine usually operate sleep labs that perform polysomnography. Dentists may be familiar with oral and craniofacial physical predictors of SDB.

Sleep apnea is usually diagnosed by a polysomnogram (PSG). This is an overnight sleep study done in a sleep lab. A PSG is a comprehensive recording of the

biophysiological changes that occur during sleep. Some of the functions that PSG monitors are rapid eye movements, heart rhythm, respiratory effort, and oxygen saturation[16]. At the present time a PSG is required by insurance companies for a patient to be considered for any type of reimbursement for treatment of sleep apnea. There are take home-sleep studies (HST) like pulse oximetry that can be used. A pulse oximeter is a device that reads the oxygen saturation from the hemoglobin in the blood, records hours of sleep and monitors the heart rate [17]. The latest HST's are small and look like watches that go on your wrist while you sleep at night. Research is being done to determine if the take HST's are accurate enough to use more regularly to make the diagnosis process more convenient for the patient and acceptable to insurance companies[18]. Studies, as recent as 2013, have shown promise using pulse oximetry in children and surgical patient's to diagnose SDB [19, 20]. PSG's tend to be more expensive and inconvenient for the patient. Dmochowski et.al is doing studies to try and predict the apnea-hypopnea index (AHI) from an overnight pulse oximeter reading[18]. Four main indicators are evaluated to determine if a person has sleep apnea. The first is the AHI, which refers to the number of apneic (cessation of breathing for 10 seconds or more) and/or hypopneic (rapid shallow breathing) events a person has in an hour. Mild sleep apnea is considered ≥ 5 but < 15 events/hr.; moderate sleep apnea is ≥ 15 but < 30 events/hr. and severe sleep apnea is ≥ 30 events /hr.[16]. Depending on the type of sleep study done, the results may come in the form of an oxygen desaturation index (ODI) or respiratory disturbance index (RDI) which includes the patient's respiratory effort related arousals (RERA) as well as the AHI. The RDI's tend to be higher because the

inclusion of the RERA's. These types of results usually accompany more extensive sleep studies like the PSG[18]. The second indicator to predict sleep apnea is the lowest oxygen saturation score. This indicates how low or deprived of oxygen the patient was during the night. This number should be as close to 90% as possible so that the body is properly oxygenated for adequate body functions[9]. The third indicator to predict sleep apnea is the percent of time the patient's oxygen saturation is below 90% (T90). Not only is it important to know how low a person desaturates (oxygenation falls below 90%) but how long they stay there [21]. The brain cells can only be without oxygen for 4 minutes before some type of permanent damage or death occurs [22]. The fourth indicator to predict sleep apnea is the mean average of oxygen the person maintained throughout the night. The mean average can vary according to altitude. For example the mean average is different between Texas and Colorado because Colorado is at a higher altitude. According to Goldberg et. al, arterial hemoglobin oxygen saturation decreases at an altitude $>1,500\text{m}$, therefore the mean oxygen average will be lower at higher altitudes [23]. This is the information a health care professional evaluates to help predict the presence of sleep apnea.

There are other instruments and techniques that can be used to predict if a patient has sleep apnea. Questionnaires can be used like the Stop-bang questionnaire or the Epworth Sleepiness Scale [24, 25] The Epworth scale has been translated into multiple languages and is used world-wide to assess patient sleepiness. These instruments ask questions that describe classic indicators of sleep apnea. Another technique is measuring the size of the patient's neck. The adjusted neck circumference (ANC) is the neck

circumference of the patient in centimeters, and adding 4cm for hypertension, 3cm for snoring, and 3 cm if the patient was noted to gasp or choke at night. Once these items are added together a chart is provided to check the probability of the patient having sleep apnea (appendix 2). A person with an ANC of 48cm has a good probability of having obstructive sleep apnea [26].

1.4 Treatment of Sleep Disorders

The gold standard non-surgical treatment for sleep disordered breathing is the use of a continuous positive airway pressure (CPAP) machine[10]. To use CPAP some type of mask and head gear is fitted to the face and the mask is attached to the machine by a hose. There are several different types of masks: full face mask, nasal mask, and nasal pillows that a patient can choose to wear. Once the mask is on securely the machine is turned on and a pre-set amount of pressurized air is delivered into the mouth and/or nose to hold open the airway to decrease the amount of AHI events throughout the night (see appendix 3). For patients with severe sleep apnea, a Bi-level positive pressure (Bi-PAP) machine can be used. Bi-PAP is similar to CPAP except it has inspiratory and expiratory pressures set. CPAP just supplies pressure on inhalation. Studies on CPAP and Bi-PAP use have shown that compliance for these machines are often less than optimal [27]. This is because these machines require daily use and maintenance, they are a significant intrusion in the bedroom environment and they can also affect quality of life [9, 28].

Other non-surgical options are therapeutic devices such as aOA's (see appendix 4). Examples of aOA's are the mandibular advancement and tongue retaining devices. The tongue retaining device is a custom appliance made of soft pliable material that retains the tongue by suction. This device is designed for edentulous patients to provide patency (opening) of the airway and promoting breathing through the nose. The mechanism of a mandibular advancement device (MAD) or aOA is to protrude the mandible enough to relieve the upper airway obstruction (tongue) which will lead to a patent airway for optimal gas exchange (see appendix 5). A recent study showed that the aOA or MAD is a preferred patient choice for treatment compared to CPAP for treating OSA[29]. Overall, CPAP is more effective for severe OSA, but compliance with the aOA seems to be greater for mild to moderate OSA[28-30].

There are some surgeries that can be performed to treat sleep apnea, such as the uvulopalatopharyngoplasty (UPPP) or nasal reconstruction [10]. There is insignificant data on the lasting effects of this surgery[10]. The goal of nasal reconstruction is to improve the patency of the nasal passages through surgery. Pharmacological treatments can target residual sleepiness with stimulants, like Provigil (modafinil) and Nuvigil (armodafinil). These drugs are understood to elevate the hypothalamic histamine levels which are assumed to be a "wakefulness promoting agent"[10].

1.5 Comorbidities of Sleep Disorders

Sleep disorders are akin to the “silent killer”, heart disease, in that they frequently go undiagnosed. The symptoms are ignored and can contribute to other health-related disorders. Comorbidities caused by sleep disorders can manifest themselves as independent diseases delaying proper diagnosis [31]. Conditions such as drug-resistant hypertension, obesity, myocardial infarction, congestive heart failure and atrial fibrillation (AF) are all comorbidities of sleep disorders [32, 33]. AF is a cardiac arrhythmia whose incidence increases with age [33]. The relationship between SDB and arrhythmias was proposed decades ago, but only recently has OSA been correlated with AF [32]. It is predicted that by 2050, more than 10 million Americans will have AF [32]. The known risk factors for AF are age, male gender, smoking, obesity, hypertension, diabetes, myocardial infarction, congestive heart failure, cardiac surgery, and obstructive sleep apnea [32]. People with SDB may be predisposed to arrhythmias because of alterations in sympathetic and parasympathetic nervous system due to the recurrent hypoxia, acidosis, apneas, and arousals caused by their condition [4]. Research performed by Mehra et al. demonstrated that patients with SDB are four times more likely to have cardiac arrhythmias. Due to these comorbidities, OSA has had a substantial economic impact on society. The potential costs attributed to OSA include diagnosis, treatment, decrease in quality of life, and an increase of motor vehicle accidents[16].

1.6 Economical Effects of OSA on Motor Vehicle Accidents

According to Kapur, obstructive sleep apnea related motor vehicle accidents cost taxpayers \$15.9 billion in the year 2000 [16]. Congress unanimously passed the bill HR3095 on October 4, 2013, which was signed by President Obama on Oct.15,2013, regarding rulemaking instead of guidance dealing with OSA and commercial truck drivers [34, 35]. The bill states “The Secretary of Transportation may implement or enforce a requirement providing for the screening, testing, or treatment (including consideration of all possible treatment alternatives) of individuals operating commercial motor vehicles for sleep disorders only if the requirement is adopted pursuant to a rulemaking proceeding” [36]. The Federal Motor Carrier Safety Administration (FMSCA) is required to perform more detailed medical and physical exams for their drivers to be qualified to drive. The compliance date for the new regulation was January 20, 2014 [37]. According to a study done by the American Association of Justice, big trucks make up less than 4% of all passenger vehicles, but are involved in 12% of all vehicle fatalities in which over 4000 people are killed each year [37]. Driver fatigue and/or health-related issues contributed to 15% of the those fatalities [37].

The Department of Transportation (DOT) data states that 28% of commercial drivers suffer from sleep apnea [37]. As of May 21, 2014 the only way to become medically certified to hold a commercial driver’s license (CDL) is to be examined by a medical examiner registered by the National Registry of Certified Medical Examiners (NRCME) [38]. The FMCSA estimates they will need 40,000 medical examiners nationally to be certified to meet the annual needs of over 4.6 million drivers [38]. The

old standard of performing medical exams to check for sleep disorders by the DOT was to provide questionnaires and use a body mass index (BMI) of 35 as a cut off for denying a license. Having a BMI of ≥ 35 is a risk factor for sleep apnea, and drivers falling in this category are required to have a sleep study. The national average cost of a polysomnogram (PSG) in 2014 is \$2,625, which could be financially out of reach for truckers without insurance [37]. Another concern is the currently recommended method of treatment. CPAP machines are the recommended treatment but compliance is less than desirable [28, 39]. To hold a CDL, the driver must be compliant with their treatment and provide proof at their physical and medical exam. According to the American Academy for Dental Sleep Medicine (AADSMD) aOA's should be a recommended treatment for people with mild or moderate sleep apnea [40]. At this time the DOT has not approved the use of an OA as a viable treatment for CDL drivers due to the lack of compliance studies performed on them [41]. Although several studies have been done on compliance and systematic effects using CPAP [4, 27, 31, 39, 42], not enough definitive studies have been performed using aOA's.

1.7 Objective and Limitations of the Study

1.7.1 Objective

This survey study was designed to assess the types of treatments sought by a cohort of sleep disordered breathing sufferers by reviewing patient's attitudes and preferences toward different treatment modalities. This study will analyze how the patients acquired

their information on sleep disorders, pre and post symptoms, and treatment preferences as well as effects of sleep disorders on their quality of life. The survey explores the use of CPAP machines, Bi-PAP machines, aOA and any other treatment modalities used to treat patients with OSA and other sleep disorders. The patient population was people who have previously been diagnosed with some type of sleep disorder. This was a cross-sectional study that used a cohort of patients from a single sleep treatment facility specializing in aOA treatment for SDB. All patients had previously been prescribed CPAP as treatment. The survey included questions on how the subjects acquired their information on sleep disorders, how long they had a sleep disorder, where and who they sought for treatment of their disorder as well as a quality of life survey.

1.7.2 Limitations

Only one facility was used in this study because the other two facilities that were approached did not have patient permission to access their patient files for research. Obtaining email addresses from patient records dating back to the late 1990's provided 296 viable email addresses. In addition to these email surveys 600 paper surveys were mailed out to patients. Because of the technical nature of some of the treatment procedures some subjects may not have known the correct name of the procedure that was performed and may have incorrectly answered certain questions. Some subjects may not answer all questions or not answer them completely and honestly.

CHAPTER II

METHODS

CPAP is the gold standard for the treatment of OSA. However, recent studies [28-30] have shown that oral appliances likewise can be highly effective. Yet, much less is known about patterns of patient use and patient preferences regarding oral appliance use. The purpose of this study was to investigate these patterns and preferences in a group of oral appliance users.

The Institute of Medicine estimates that 50 to 70 million adult Americans have some type of chronic sleep disorder that contributes to poor health [3]. Over the past 20 years the percentage of men and women sleeping less than 6 hours per night has increased significantly [3]. Like the “silent killer” heart disease, OSA can go undiagnosed because the symptoms may contribute to other health related issues. Due to the loss of billions of tax dollars caused by OSA related motor vehicle accidents, Congress unanimously passed bill HR3095 on October 4, 2013. This bill was signed by President Obama on October 15, 2013, regarding rulemaking instead of guidance dealing with OSA and commercial truck drivers[34, 35]. A study showed that big trucks make up less than 4% of all passenger vehicles, but are involved in 12% of all vehicle fatalities in which over 4000 people are killed each year[37]. The Department of Transportation (DOT) data states that 28% of commercial drivers suffer from sleep apnea[37].

According to American Academy for Dental Sleep Medicine(AADSM) oral appliances should be the first line of treatment for people with mild or moderate sleep apnea[40]. Severity of apnea is defined by AHI, which refers to the number of apneic (cessation of breathing for 10 seconds or more) and/or hypopneic (rapid shallow breathing) events a person has in an hour. Mild sleep apnea is considered ≥ 5 but < 15 events/hr.; moderate sleep apnea is ≥ 15 but < 30 events/hr. and severe sleep apnea is ≥ 30 events /hr.[16]. Treatment is considered successful when the apnea-hypopnea index (AHI) is < 5 or shows substantial reduction, defined as reduction in the index of at least 50% from the baseline value [43].

Studies done comparing OA's and CPAP have shown no significant differences in treating the symptoms of mild and moderate sleep apnea[43-45]. Li et.al performed a meta-analysis of 14 trials that were acquired from MEDLINE, PubMed, EMBASE, and Central Register of Controlled trials. The results demonstrated that the effects on Epworth Sleepiness Scale score, health-related quality of life, cognitive performance, and blood pressure of OAs and CPAP were all similar[44]. While studies have examined patient preferences and patterns for CPAP [46-48], less is known regarding oral appliances. Even though most studies prove that CPAP is more effective treating OSA, the patient population tends to choose OA's for long term treatment of their symptoms [44, 49]. However, the reasons for this preference have not been systematically explored. Likewise, little is known about patient's attitudes and preferences regarding OA's. Growing research on sleep disorders and the physiopathology of OSA has demonstrated dentistry playing an important role through the use of OA's in increasing the lifespan of

individuals with OSA [50]. The etiology of this condition appears to be a combination of craniofacial abnormalities and neuromuscular factors that lead to the collapsibility of the upper airways [50]. The ability to titrate the MAD or aOA's has proven effective in decreasing the AHI, increasing oxyhemoglobin saturation (SaO₂) during sleep, reducing blood pressure, and improving heart rate variability [50, 51].

There have been several studies performed on the compliance and preferences of CPAP users [27, 39, 44, 52]. This study will address the patterns of patient use and preferences of oral appliance users. We would like to know what the subject's preferential treatment modality is in regards to ease of travel, emotional and societal effects as well as interference with quality of life.

2.1 Subjects

The inclusion criteria for the participants are: 1. previously have had a sleep study and were diagnosed with some type of sleep disordered breathing condition, 2. offered CPAP for initial treatment; 3. subjects are seeking treatment at a dental facility that only provides oral appliances for treatment of SDB. Subjects initially were to be chosen from 3 dental practices that only supplied aOA for treatment of SDB. Data was only complied from one dental office due to the fact that they had previously had their patients sign consent forms for future study and research and the others had not.

2.2 Description of the Survey Instrument

A survey was developed to analyze patient knowledge of sleep disorders and treatments. Questions were asked about symptoms, treatment modalities, and the effect of the treatments on their quality of life. The Calgary Sleep apnea quality of life index short form section I was used as part of the survey to analyze quality of life. The Calgary Sleep Apnea Quality of Life Index (SAQLI) has been designed as a disease specific quality of life(QOL) measure that will be sensitive in detecting change in the QOL of people with sleep apnea who have undergone some type of treatment intervention[53]. Other questions in the survey consisted of patient demographics: age, sex, race, and occupation. There are questions that asked what type of SDB they sought treatment for , what type of SDB they are currently being treated for, who have they seen for treatment and who are they currently seeing for treatment. The last groups of questions are a comparison of the two treatment modalities CPAP and OA's. They compare the difficulty of traveling, the level of comfort, how rested they feel in the morning, and the interference of quality of life after using CPAP or OA for treatment.

2.2.1 Pilot Testing Procedures

Before testing was done, the survey was approved by the Institutional Review Board (IRB) Texas A&M University Baylor College of Dentistry. The survey was given to 10 current aOA users. The survey was sent by mail and email. A link to Kwik Survey with the survey questions was sent to the focus groups available email. Each individual was

given these instructions: 1) record the time it takes to complete the survey, 2) provide information on the clarity of the questions, 3) and return the survey in one week. Once the surveys were returned the data was analyzed and changes were made to improve the survey instrument based on subjects' responses. Some of the changes that were made after the pilot survey was done were the addition of current symptoms to the SAQLI. The survey originally asked for symptoms before treatment only. Another change that was made after the pilot survey was simplifying language in some of the questions. This simplification made the questions less confusing while getting the information that was needed.

The survey instrument consisted of 43 questions. The questions contain multiple choice, yes/no, and Likert scale questions. The Likert scale rates a subject from 1 to 7, with 1 being the least and 7 being the most. The survey took approximately 20 minutes to complete. The questions were grouped by topics. The topics include demographics, knowledge, and practices. The demographic questions were intended to acquire pertinent data on their race, age, sex, and occupation. There were questions about knowledge and symptoms of sleep disorders, which treatments were used and are currently being used to manage subjects' sleep disorders, and to determine the effect if any the treatment modalities had on their quality of life (SAQLI).

The survey was mailed and emailed to 600 and 296 individuals respectively who had been diagnosed with a sleep disorder within the past 15 years. A systematic random sampling formula was created to choose from the available files from a dental office that only provide aOA to their patients. A mailing list was assembled from those charts

randomly pulled. An email list was also compiled from what was available. There was a wide range of years from 1998 to the present so email addresses were not readily available in some of the charts that were chosen. Each participant received an informed consent form, cover letter, survey (Appendix 1), and a stamped return envelope addressed to the researcher at Texas A&M University Baylor College of Dentistry.

2.2.2 Statistical Analysis

This survey was a retrospective cross-sectional study which gathered information from participants' past and present treatment history. SPSS software was used to analyze the data. The data gathered was ordinal and was analyzed by non-parametric procedures. For the SAQLI questions the Wilcoxon Signed Rank test was used. The Mann-Whitney U-test was the non-parametric test used for the comparison questions about CPAP and OA's to analyze the data at a 95% confidence level. The information was gathered from subject's files only when they had previously signed a consent form.

2.3 Limitations

Obtaining email addresses from patient records in the late 1990's was difficult due to the lack of home computer usage at this time. It also took quite some time to acquire enough addresses for the calculated sample because of the lengthy period of recall. Having access to only one facility to acquire patient data, instead of the intended 3,

limited our ultimate sample sizes. Because of the technical nature of some procedures, some subjects did not know how to answer some of the questions.

2.4 Results

There were 600 written survey's mailed. Out of the 600 there were 58 viable responses and 61 packages returned to sender. There were 296 online surveys sent out 5 days after the original mailing with email addresses obtained from the original 600 subjects. 26 responses were received from the online survey with only 9 duplicates from the 58 written responses received. Another 263 online surveys were sent out with 21 responses and 10 duplicates from the previous online survey. Therefore out of 896 written and online surveys 86 viable responses were obtained. This comes to a 10% response rate and not the desired 25% response rate.

The ages ranged from 40-84 with a mean age of 62.15 and a mode age of 64. The subjects were 70.9% male and 29.1% female. The ethnicity of the group was 93% White, 4.7% Black, and 2.3% Asian. The occupations for the subjects were quite diverse from homemakers to bankers and physicians. Subjects acquired 94.3% of their knowledge about sleep disorders from various sources including primary care physicians, dentists, sleep doctors, the internet, family, and friends. Subjects were asked how long they have had a sleep disorder resulting in the following frequencies: 0-2 years=5.8%, 3-5 years=15.1%, 6 years or more=76.7% and 2.3% went unanswered.

The subjects were asked several questions about their approach to treatment: What type of SDB were you seeking treatment for? What SDB are you currently being treated for? Who have you seen to treat your SDB, and who do you currently see for your SDB? The results (Table 1) show that the majority of the subjects initially sought treatment for snoring (40.7%) and a combination of snoring and OSA (24.4%). Currently, 37.2% are being treated for combination snoring and OSA, 31.4% treated for OSA, and only 18.6% being treated for snoring. The subjects have primarily seen sleep physician or a dentist (27.9%) for initial treatment. Some of the subjects sought no treatment (3.5%). For current treatment the subjects see dentists (37.2%), a combination of dentists and sleep physician (20.9%), and 10.5% are currently not seeking treatment.

Table 1: Approach to treatment

	What SDB did you seek treatment for?	What SDB are you currently treated for?	Who have you seen for your SDB?	Who do you currently see for your SDB?
a	Snoring= 40.7%	Combo snoring/OSA= 37.2%	Sleep MD/DDS= 27.9%	DDS= 37.2%
b	Combo of snoring/OSA= 24.4%	OSA= 31.4%	DDS= 19.8%	Sleep MD/DDS= 20.9%
c	OSA= 22.1%	Snoring= 18.6%	MD/ Sleep MD/DDS= 18.6%	Sleep MD= 19.8%
d	Other (e.g. restlessness, insomnia, or fatigue)= 4.7%	Other(e.g. restlessness, insomnia, or fatigue)= 5.8%	Sleep MD= 11.6%	No one= 10.5%
e	Snoring/OSA/UARS= 3.5%	Snoring/OSA/UARS= 3.5%	MD/ sleep MD= 5.8%	Other(e.g. ENT or pulmonologist)= 3.5%
f	Snoring/other= 2.3%	UARS= 2.3%	MD= 4.7%	MD= 2.3%
g	Snoring/OSA/other= 1.2%	UARS/other= 1.2%	No one= 3.5%	MD/sleep MD= 2.3%
h	OSA/UARS= 1.2%		Other(e.g. ENT or pulmonologist)= 3.5%	Sleep MD/ DDS/other= 2.3%
i			MD/DDS= 2.3%	MD/sleep MD/ DDS= 1.2%
j			Sleep MD/DDS/other= 2.3%	

Next are the results of the SAQLI which used a likert scale of 1-7, where 1 is the least and 7 is the most, to answer questions that reflect patient symptoms before and after treatment. In Fig. 1 the results show significant improvement in all QOL measures after treatment. For example in Fig. 1A (How much have you had to push yourself to stay alert during a typical day?), before treatment the majority of the subjects answered moderate to large amount of energy to stay alert (24.4%) during the day. After treatment the majority of the subjects stated that it took a small amount of energy to stay alert

(37.2%) during the day. Other questions (Fig. 1, B-F) showed improvements in energy, tiredness, sociability, and mood.

FIG. 1-SAQLI ENERGY LEVELS

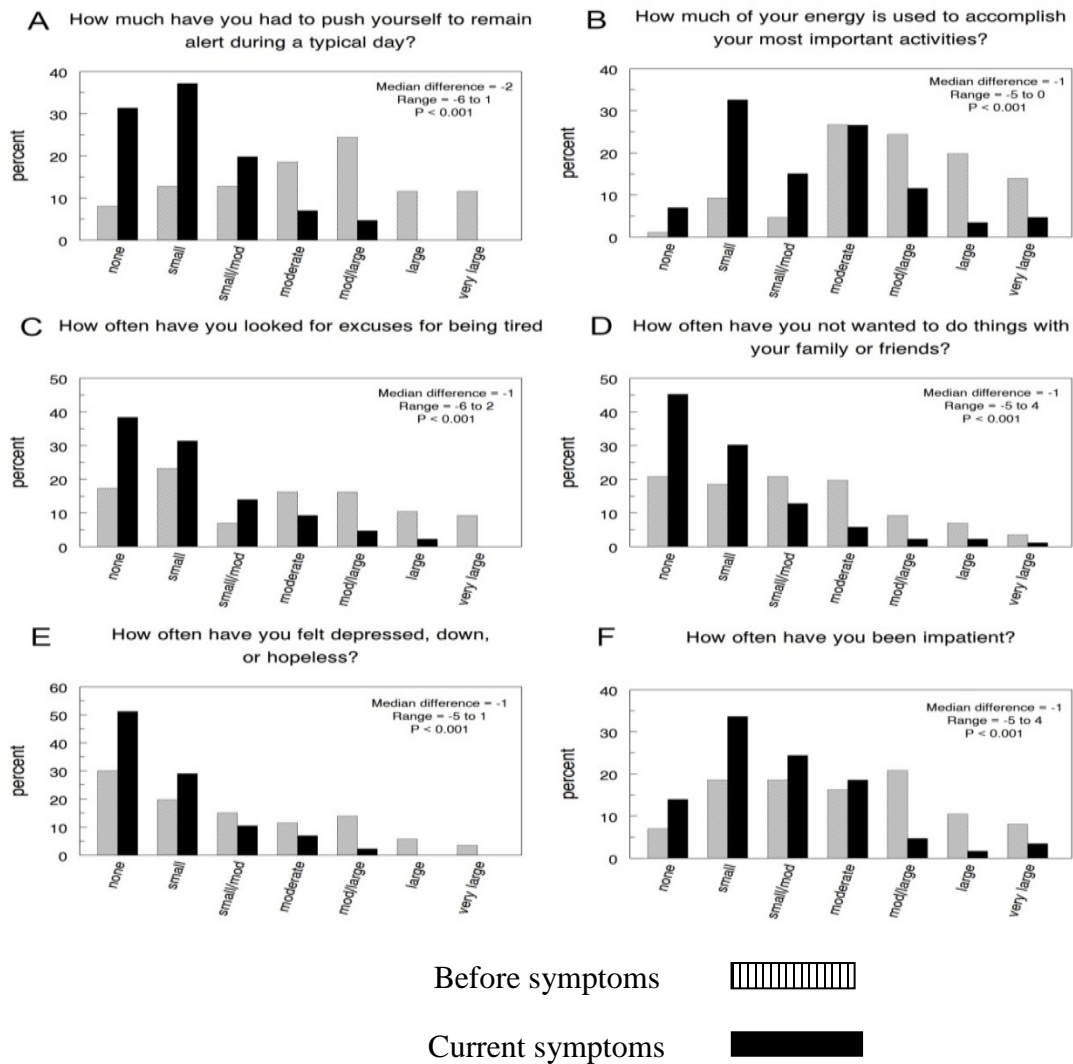
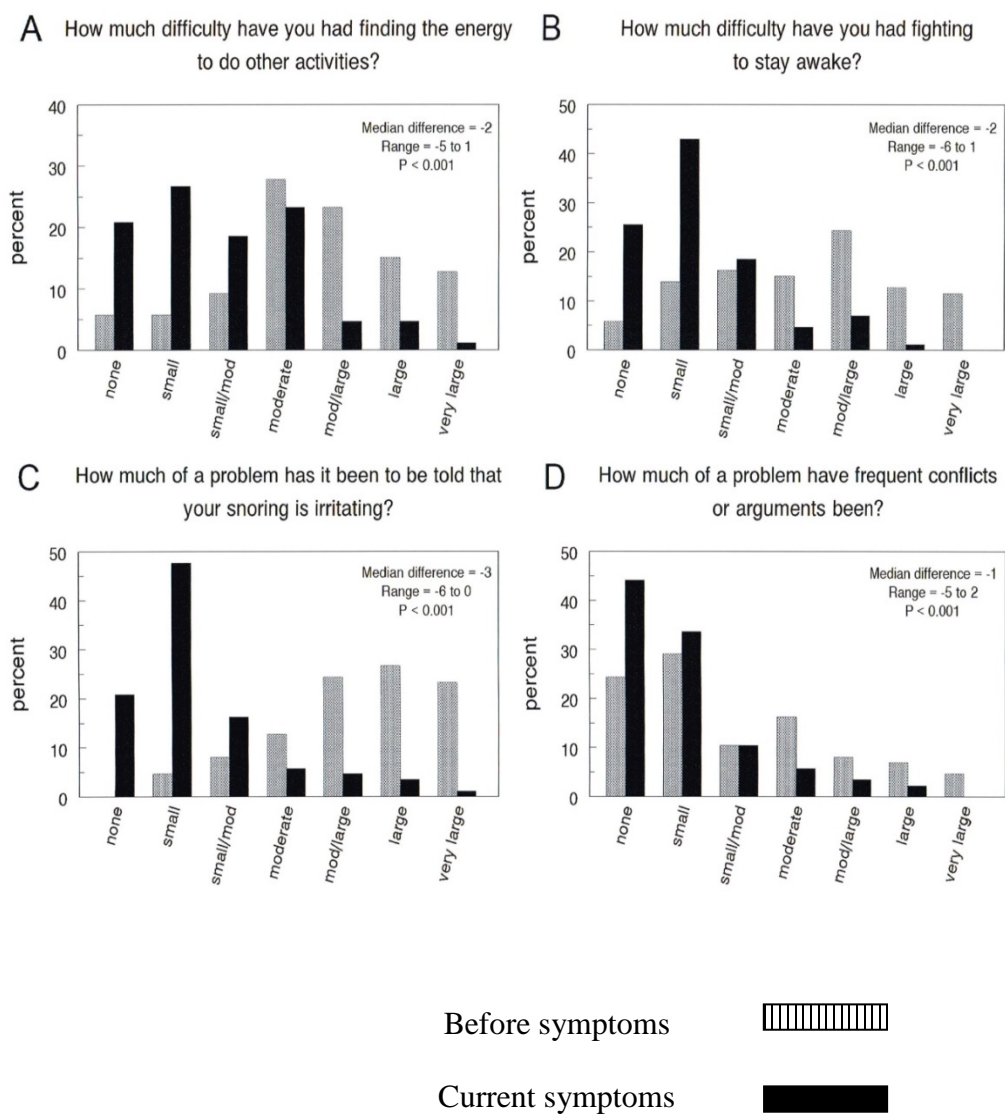
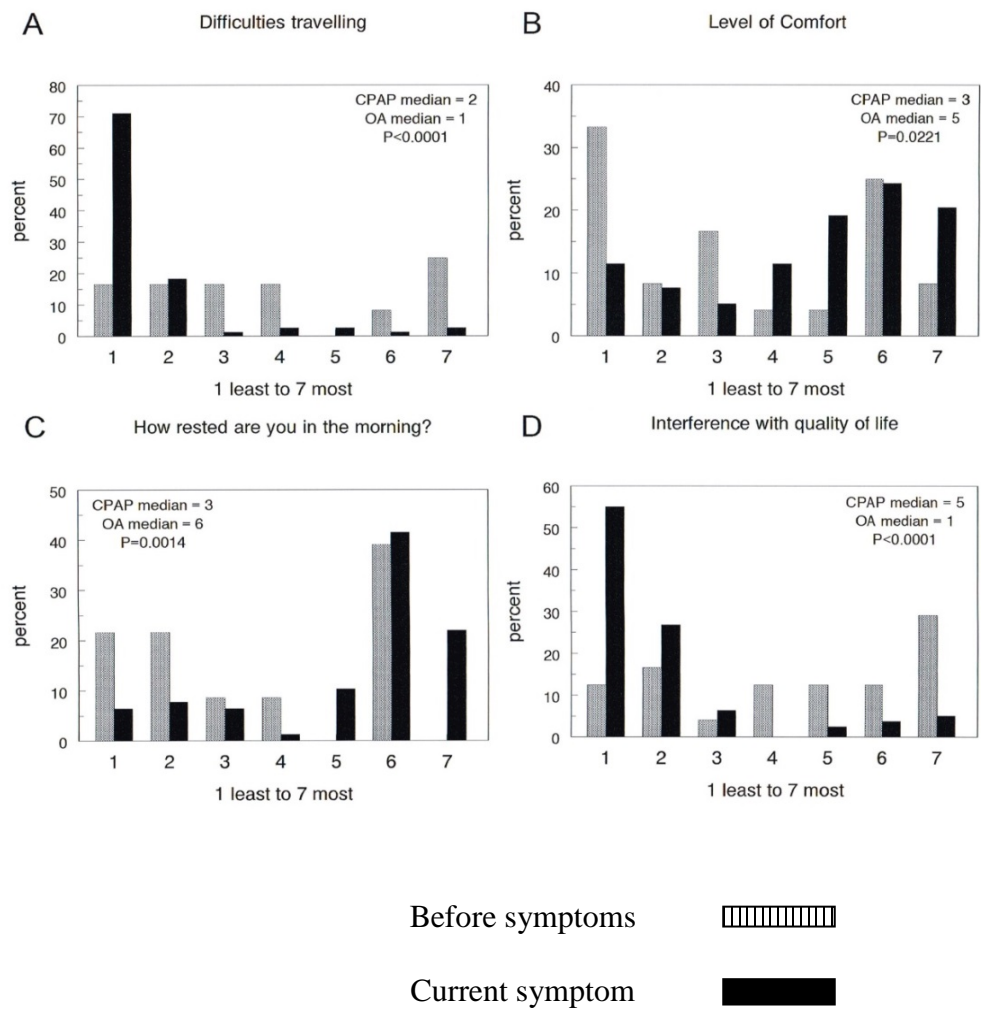


FIG. 2-SAQLI DIFFICULTIES AND PROBLEMS



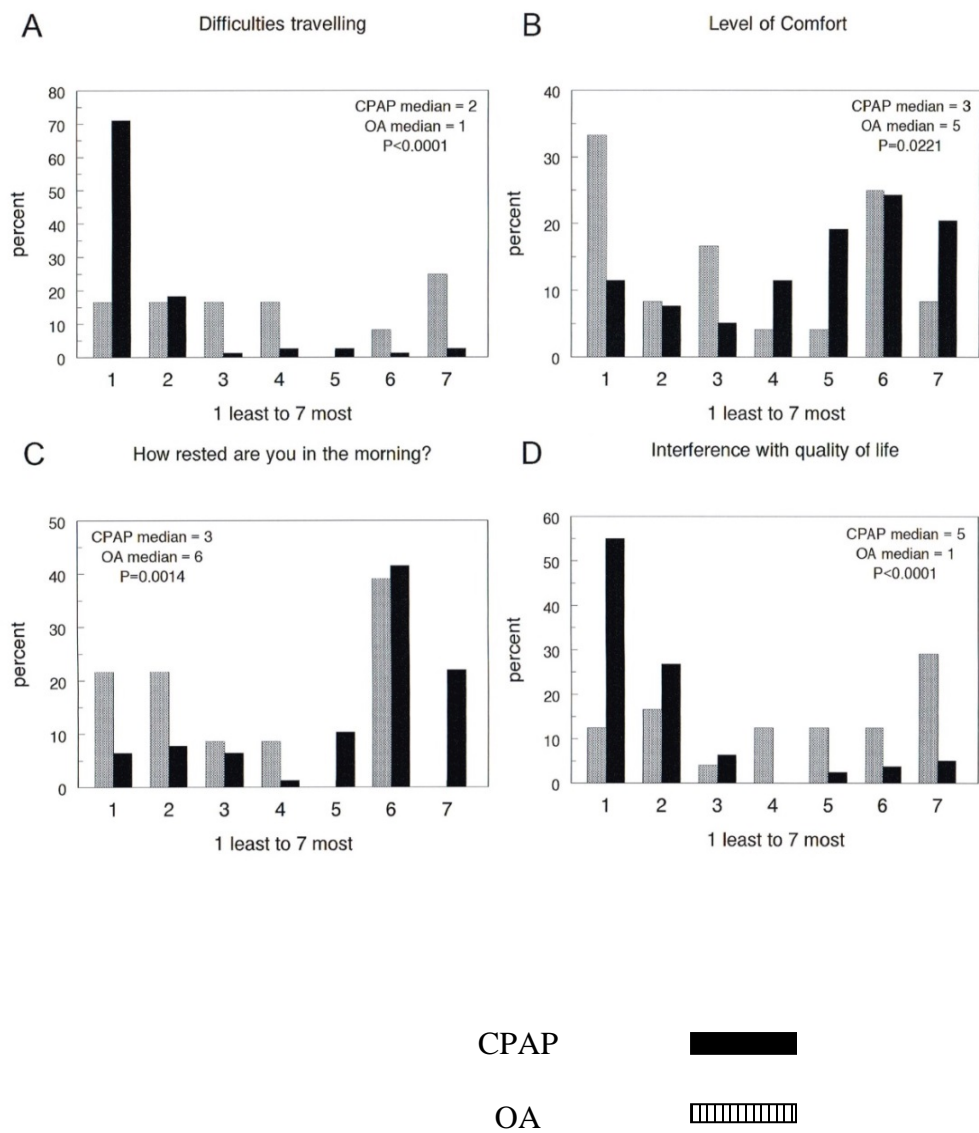
The next group of QOL questions relates to the subject's difficulties and problems that arise from lack of sleep and energy that affects their mental and emotional status. The results of these questions are in Figs. 2 and 3. Even though there is significant improvement in all of the symptoms after treatment, some improvements were quite large. For example, in Fig. 2B (How much difficulties have you had fighting to staying awake?), subject's responded 24.4% moderate to large amount of energy to stay awake before treatment and 43% small amount after treatment. Fig.2C (How much of a problem has it been to be told that your snoring is irritating?), subject's response was 26.7% large amount of irritation before treatment and 47.7% a small amount of irritation after treatment. There were also large changes in Fig. 3C&D. Fig.3C(How much of a problem have you had with fatigue?), subject's response was 20.9% moderate to large amount of problem with fatigue before treatment and 38.4% was a small amount of problem with fatigue after treatment. Fig.3D (How much of a problem have you had waking up feeling unrefreshed?), subject's response was 22.1% did not feel refreshed in the morning before treatment and 41.9% had a small amount of problem feeling refreshed after treatment.

FIG. 3-SAQLI LEVELS OF COMFORT



Using a likert scale of 1-7, there are questions which compare CPAP to aOA's under the same conditions. The results of these questions also show a significant change in before and after treatment. But a large change was reflected in Fig.4 A & D. Fig. 4A (How much difficulty do they have traveling using CPAP or OA?), the subjects response was 3.5% had difficulty traveling with CPAP and 2.3 % had no problem. For this same question 2.3% of the subject's had problems traveling with OA's and 62.8% had no problems. In Fig. 4D (Has treating your SDB with CPAP or OA's interfered with your quality of life?), subjects response was 8.1% stated that the use of CPAP interfered with their quality of life and 3.5% stated that it did not. The results for OA's were 4.7% stated that it interfered with their quality of life and 50% stated that they did not. This study shows the subjects believe using oral appliances benefits them better while traveling and creates less interference in their quality of life.

FIG. 4-COMPARISON GRAPHS



CHAPTER III

DISCUSSION AND CONCLUSION

3.1 Discussion

This survey is one of the first to address general knowledge of sleep disorders by apnea sufferers. The survey reviewed how the subjects acquired their knowledge of sleep disorders, their pre and post symptoms after treatment, and if their choice of treatment interfered with their QOL. The subjects acquired 94.3% of their knowledge about sleep disorders from various sources including primary care physicians, dentists, sleep doctors, the internet, family and friends. In 2006 the Institute of Medicine Committee of Sleep Medicine and Research commissioned a book on improving awareness, diagnosis, and treatment of sleep disorders[54]. The United States government has made attempts in public awareness of the health issues caused by sleep disorders by initiation of “Sleep: a health imperative” to educate the nation on the importance of adequate sleep [3]. There also was an attempt by Firestone in exploring the knowledge and attitudes of taxi drivers in Wellington New Zealand in regards to OSA[55]. Firestone concluded that the taxi drivers need systematic education to help them understand sleep deficiency and OSA’s effects on their driving skills and safety [55].

A few of the symptoms that accompany sleep disorders are fatigue, snoring, gasping for breath, daytime sleepiness, and depression[25, 31]. Research is being done to provide sleep disorder sufferers with treatments they can use to manage their symptoms so they can live a relatively normal life. There have been many studies done on CPAP, as it has

been the treatment of choice since the discovery of sleep disorders [16, 27, 52]. Recent studies suggest that OA are a viable treatment choice for mild or moderate sleep apnea [16, 27, 52, 56]. The fact that this data has recently been published has not given patients much time to utilize OA therapy. This study and a few others have begun to compare the use of CPAP and OA as treatments, to analyze effectiveness and patient preference [43, 44, 57]. Our study shows that all symptoms had improved with treatment. There were two main treatment modalities that were chosen: CPAP and OA's. In our survey, 11.6% of patients chose to continue CPAP following initial treatment while 80.2% opted for OA's. The comparison questions between the treatment modalities CPAP and OA's analyzed the patient's difficulty traveling, level of comfort, if they felt refreshed in the morning, and if the treatment affected their QOL. The results showed that of the 11.6% of CPAP users, 3.5% stated that it caused difficulty traveling. In the CPAP group, the feeling of most comfort is 2.3%, waking up feeling refreshed is 10.5%, and 8.1% feel that it has affected their QOL. Of the 80.2% of OA users, 2.3% have difficulty traveling, 18.6% had the most feeling comfort, waking up feeling refreshed 19.8%, and 4.7% say it affects their QOL. Overall the majority of the subjects chose aOA's as their treatment of choice. Because the research of using aOA's for a consistent treatment for SDB is still in its early stages, studies like this one are needed to get closer to giving SDB sufferer's treatment choices. If the SDB sufferers can treat their symptoms with their preferred treatment then this will provide them with the QOL they want.

Quality of life addresses how SDB affects the physical, emotional, and social aspects of a person's life[47]. The short form of the Calgary Sleep Apnea Quality of Life

index was used to acquire the data for this study. This study demonstrates that any form of treatment improves quality of life. SDB is a progressive disease and left untreated the mortality rate for severe OSA is 30% at 15 years [58]. Education is the key to early detection of SDB. We should not only educate the general public, but also the health care professionals.

This study showed that dentists lead in current treatment of SDB at 37.2%; therefore it is only natural for dentistry to take an educational lead. A 2012 survey was given to 58 US dental schools on the amount of somnology hours in their predoctoral curriculum. They discovered that even though 75.5% of the schools participated in the survey, the schools averaged 3.92 educational hours on SDB[59]. There are 250 qualified treatment centers nationwide that only treat approximately 5% of OSA sufferers, this alone makes it imperative that dental education fill the void and train professionals for the future[60]. The UTHSC College of Dentistry is adding OSA and snoring to the predoctoral dental curriculum. UTHSC believes the dental profession is not doing enough to help diagnose this underdiagnosed disease[60]. Sleep disorders affect 50-70 million Americans therefore UTHSC suggests that educating students about OSA and early engagement in treatment can help dental professional have a fighting chance with this steadily rising disease[60]. Educating dentists and hygienists in the art of early detection of SDB can help the general public recognize and seek treatment for sleep disorders.

3.2 Conclusion

This study surveyed quality of life in a group of sleep disorder sufferers, who primarily chose OA as their preferred treatment. While CPAP is effective for severe OSA, recent studies have indicated that OA is effective for mild and moderate OSA [28-30]. Yet we know relatively little about knowledge and preferences in this population. This survey revealed that 59.3% primarily obtained their knowledge about sleep disorders from their sleep physician and dentist. After the survey 11.6% of the subjects chose to continue to use CPAP and 80.2% chose to use OA's. The survey showed that 76.7% of the survey subjects suffered with SDB for 6years or more. Having SDB led to decreased physical, emotional, and social aspects of their lives which than led to poor quality of life. The survey showed significant improvement in all aspects of quality of life after treatment. By educating the community and health care professionals we can work together to help keep this progressive disease from getting out of hand. With this knowledge we can decrease OSA related fatalities that causes economic spending and improve the quality of life of apnea sufferers. In 2012 it was recorded by the National Center for Health Statistics that 61.6% of the population visited the dentist[61]. With questionnaires about SDB's added to the health history forms and predicting techniques used by the dentists and hygienists during exams they can help identify patients at risk for OSA.

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APPENDIX I

SURVEY

Directions: Please read each question carefully and select the answers that best fit your situation and fill in the blanks where a written answer is required. This survey has 43 questions and will take approximately 20 minutes to complete. Your answers will be completely confidential. Thank you for your participation.

Sleep Apnea Quality of Life Index

Please answer questions 1-14 in regards to your symptoms before and after you were treated. We would like to understand whether **your sleep apnea and /or snoring** has had an impact on your daily activities, emotions, social interactions, and about symptoms that may have resulted.

Please Score the following Questions According to the Following: (fill in the circle)

1=a very large 2=a large 3=a moderate to large 4=a moderate 5=a small to moderate 6=a small 7=no or none

1. How much (amount) have you had to push yourself to remain alert during a typical day (e.g. work, school, childcare, housework)?

Symptoms before: a very large a large a moderate to large a moderate a small to moderate a small no/none

Current symptoms: a very large a large a moderate to large a moderate a small to moderate a small no / none

2. How much (amount of time) of your energy is used to accomplish your most important activity (e.g. work, school, childcare, housework)?

Symptoms before: a very large a large a moderate to large a moderate a small to moderate a small no /none

Current symptoms: a very large a large a moderate to large a moderate a small to moderate a small no /none

3. How much difficulty (amount) have you had finding the energy to do other activities (e.g. exercise, relaxing)?

Symptoms before: a very large a large a moderate to large a moderate a small to moderate a small no/none

Current symptoms: a very large a large a moderate to large a moderate a small to moderate a small no /none

4. How much difficulty (amount) have you had fighting to stay awake?

Symptoms before: a very large a large a moderate to large a moderate a small to moderate a small no / none

Current symptoms: a very large a large a moderate to large a moderate a small to moderate a small no /none

5. How much of a problem has it been to be told that your snoring is irritating?

Symptoms before :	a very large	a large	a moderate to large	a moderate	a small to moderate	a small	no / none
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Current symptoms:	a very large	a large	a moderate to large	a moderate	a small to moderate	a small	no / none
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. How much of a <u>problem</u> have frequent conflicts or arguments been?							
Symptoms before:	a very large	a large	a moderate to large	a moderate	a small to moderate	a small	no / none
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Current symptoms:	a very large	a large	a moderate to large	a moderate	a small to moderate	a small	no / none
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. How often (amount of time) have you looked for excuses for being tired?							
Symptoms before:	a very large	a large	a moderate to large	a moderate	a small to moderate	a small	no / none
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Current symptoms:	a very large	a large	a moderate to large	a moderate	a small to moderate	a small	no / none
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. How often (amount of time) have you not wanted to do things with your family and /or friends?							
Symptoms before:	a very large	a large	a moderate to large	a moderate	a small to moderate	a small	no / none
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Current symptoms:	a very large	a large	a moderate to large	a moderate	a small to moderate	a small	no / none
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. How often (amount of time) have you felt depressed, down, or hopeless?							
Symptoms before:	a very large	a large	a moderate to large	a moderate	a small to moderate	a small	no / none
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Current symptoms:	a very large	a large	a moderate to large	a moderate	a small to moderate	a small	no / none
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

10. How often (amount of time) have you been impatient?

Symptoms before: a very large a large a moderate to large a moderate a small to moderate a small no/none

☐ ☐ ☐ ☐ ☐ ☐ ☐

Current symptoms: a very large a large a moderate to large a moderate a small to moderate a small no / none

☐ ☐ ☐ ☐ ☐ ☐ ☐

11. How much of a problem has it been to cope with everyday issues?

Symptoms before: a very large a large a moderate to large a moderate a small to moderate a small no/ none

☐ ☐ ☐ ☐ ☐ ☐ ☐

Current symptoms: a very large a large a moderate to large a moderate a small to moderate a small no / none

☐ ☐ ☐ ☐ ☐ ☐ ☐

12. How much of a problem have you had with decreased energy?

Symptoms before: a very large a large a moderate to large a moderate a small to moderate a small no/ none

☐ ☐ ☐ ☐ ☐ ☐ ☐

Current symptoms: a very large a large a moderate to large a moderate a small to moderate a small no / none

☐ ☐ ☐ ☐ ☐ ☐ ☐

13. How much of a problem have you had with fatigue?

Symptoms before: a very large a large a moderate to large a moderate a small to moderate a small no /none

☐ ☐ ☐ ☐ ☐ ☐ ☐

Current symptoms: a very large a large a moderate to large a moderate a small to moderate a small no /none

☐ ☐ ☐ ☐ ☐ ☐ ☐

14. How much of a problem have you had waking up feeling unrefreshed?

Symptoms before: a very large a large a moderate to large a moderate a small to moderate a small no /none

☐ ☐ ☐ ☐ ☐ ☐ ☐

Current symptoms: a very large a large a moderate to large a moderate a small to moderate a small no/none

☐ ☐ ☐ ☐ ☐ ☐ ☐

15 Age_____

16 Sex (circle one) M/ F

17 To what ethnic group do you belong?

a. White

b. Black

c. Asian

d. Hispanic

e. Other_____

18 What is your occupation? (fill in the blank)

19 How long have you had a sleep disordered breathing condition?

a. 0-2 years

b. 3-5 years

c. 6 or more years

20 What sleep disordered breathing condition did you seek treatment for initially? (choose all that apply)

a. Snoring

b. Obstructive sleep apnea

c. Upper airway resistance syndrome

d. Other_____

21 What sleep disordered breathing condition are you being treated for? (choose all that apply)

a. Snoring

b. Obstructive sleep apnea

c. Upper airway resistance syndrome

d. Other_____

22 How did you get your information on sleep disorders? (choose all that apply)

- a. Internet
- b. Family/friends
- c. Physician/dentist
- d. Library
- e. Newspaper/magazine
- f. Other_____

23 Who do you currently see for your sleep disordered breathing condition?

(choose all that apply)

- a. Family physician
- b. Sleep physician
- c. Dentist
- d. No one
- e. Other_____

24 Who have you seen for your sleep disordered breathing condition? (choose all that apply)

- a. Family physician
- b. Sleep physician
- c. Dentist
- d. No one
- e. Other_____

25 Do you use any type of pharmacological treatment that helps you stay awake? (choose all that apply)

- a. Provigil (Modafinil)
- b. Nuvigil (Armodafinil)
- c. Ritalin (Methylphenidate)
- d. Adderall (Amphetamine)
- e. None
- f. Other_____

26 Do you use any type of pharmacological treatment that helps you go to sleep?(choose all that apply)

- a. Ambien (Zolpidem)
- b. Lunesta (Eszopiclone)
- c. Sominex (Diphenhydramine)
- d. Melatonin (Synthetic hormone)
- e. None
- f. Other _____

27 Have you used any of these treatments for your sleep disordered breathing condition? (choose all that apply)

- a. Uvulopalatopharyngoplasty(UPPP) surgery
- b. Pillar implants
- c. Nasal reconstruction surgery

- d. Continuous Positive Airway Pressure machine (CPAP)
- e. Bi-level Positive Airway Pressure machine (Bi-PAP)
- f. Mandibular surgery
- g. Distraction osteogenesis
- h. Oral appliances such as the Thornton Adjustable Positioner (TAP), SomnoDent or Elastic Mandibular Advancement Device (EMA)
- i. Other_____

28 What device do you currently use to manage your sleep disordered breathing condition?(choose all that apply)

- a. CPAP
- b. Bi-PAP
- c. TAP
- d. Herbst
- e. EMA

f. Other (describe) _____

29 If you use CPAP/Bi-PAP, what type of attachment do you wear with your machine? (choose all that apply or not applicable)

- a. Face Mask
- b. Nasal pillows
- c. Nasal Mask
- d. Hybrid Mask
- e. Oral appliance
- f. Not applicable
- g. Other _____

30 Do you wear your CPAP/Bi-PAP machine every night? Yes _____ No _____.

If yes, how many hours per night?

- a. 0-4

- b. 5-7

- c. 8 or more

- d. Not applicable

31 Have you had any of these complications while using a positive airway pressure machine like CPAP or Bi-PAP? (choose all that apply)

- a. Leakage
- b. Sinus problems
- c. Tear duct problems
- d. Dry mouth
- e. Excess fluid from tubing
- f. Excess air in stomach
- g. Breakdown of skin
- h. Claustrophobic feeling
- i. None
- j. Not applicable
- k. Other _____

32 Does your sleep disorder restrict you from traveling?

- a. Yes
- b. No
- c. Not applicable

33 If you answered yes to #32 and use a CPAP/Bi-PAP machine, how difficult is traveling? (on a scale from 1-7, with 1 being the least difficult, 7 the most difficult, and N/A is not applicable). Circle one.

1 2 3 4 5 6 7 N/A

34 On a scale from 1 -7 what is your amount of comfort using CPAP/Bi-PAP. (1 is the least comfortable, 7 the most comfortable and N/A is not applicable). Circle one.

1 2 3 4 5 6 7 N/A

35 On a scale from 1-7, how refreshed or rested do you feel the next morning after using CPAP/Bi-PAP? (1 is the least rested 7 the most rested and N/A is not applicable). Circle one.

1 2 3 4 5 6 7 N/A

36 Has treating your sleep disordered breathing condition with CPAP/Bi-PAP interfered with your quality of life? (Quality of life meaning that you have the strength and energy to accomplish the life tasks that you want in order to lead a fulfilling life) (1 is the least interference, 7 the most interference, and N/A is not applicable). Circle one.

1 2 3 4 5 6 7 N/A

37 Are you still using your CPAP/Bi-PAP machine to manage your sleep disordered breathing condition?

- a. Yes
- b. No
- c. Not applicable

38 Have you had any of these complications while using an oral appliance? (choose all that apply)

- a. Sore teeth
- b. Jaw pain/discomfort
- c. Excessive saliva
- d. Dry mouth
- e. Claustrophobic feeling
- f. Not applicable
- g. Other_____

39 How difficult is traveling using an oral appliance? (on a scale from 1-7,

with 1 being the least difficult, 7 the most difficult, and N/A is not applicable). Circle one

1 2 3 4 5 6 7 N/A

40 On a scale from 1 -7 what is your amount of comfort using oral appliance. (1 is the least comfortable, 7 the most comfortable and N/A is not applicable). Circle one.

1 2 3 4 5 6 7 N/A

41 On a scale from 1-7, how refreshed or rested do you feel the next morning after using oral appliance? (1 is the least rested 7 the most rested and N/A is not applicable). Circle one.

1 2 3 4 5 6 7 N/A

42 Has treating your sleep disordered breathing condition with oral appliance interfered with your quality of life?
(Quality of life meaning that you have the strength and energy to accomplish the life tasks that you want in order to lead a fulfilling life) (1 is the least interference, 7 the most interference, and N/A is not applicable). Circle one.

1 2 3 4 5 6 7 N/A

43 Are you still using your oral appliance to manage your sleep disordered breathing condition?

- a. Yes
- b. No
- c. Not applicable

Comments:

Thank You for your Participation!!

APPENDIX II

ADJUSTED NECK CIRCUMFERENCE

Neck Circumference (In) _____ X 2.54 _____ cm

Add 4 cm for hypertension	_____ cm
Add 3 cm for snoring	_____ cm
<u>Add 3 cm for gasping/choking</u>	_____ cm
Total	_____ cm

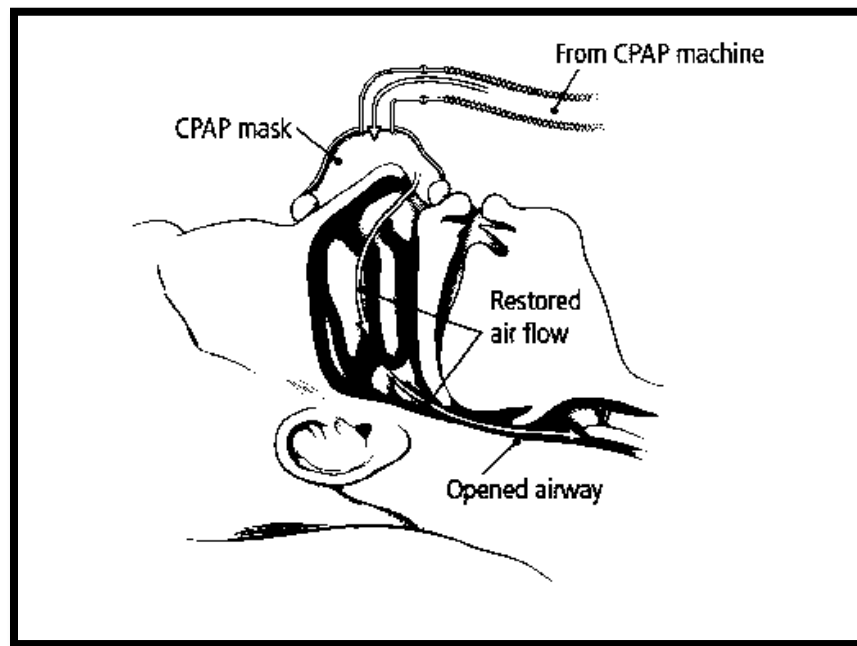
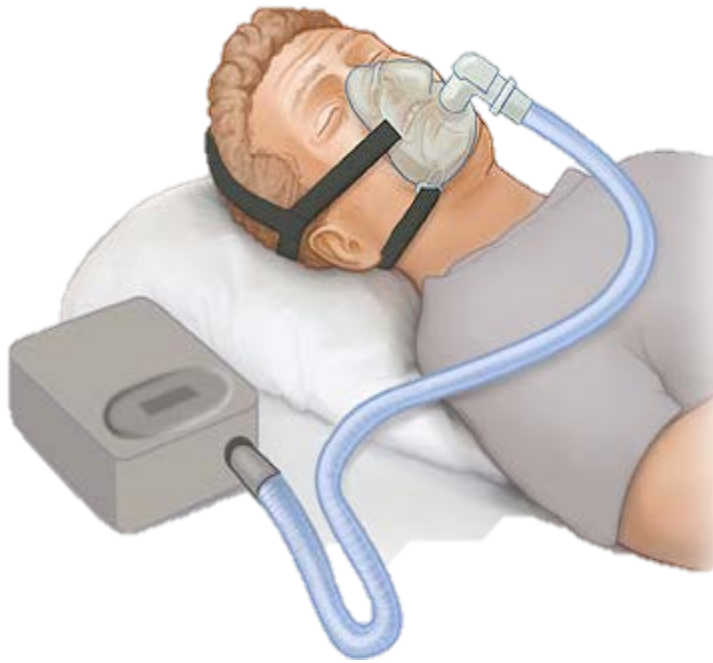
Probability of Obstructive
Sleep Apnea

_____ Low 43*	
_____ Intermediate (43-48)	
_____ High > 48	

*Note that if a patient's neck size falls in the low category and they still have the fatigue symptoms it is likely that they may have Upper Airway Resistance Syndrome.

APPENDIX III

CPAP MASK AND WORKING DESCRIPTIONS



APPENDIX IV

SAMPLE OF TAP ORAL APPLIANCE

Relief for Snoring
and Sleep Apnea



APPENDIX V

MODE OF OPERATIONS OF aOA

