School of Dental Medicine

The Current State of Dental Sleep Medicine Practice in Academic Institutions: A Questionnaire-Based Study

A Thesis

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ABSTRACT

Aim: The aim of this study was to evaluate the current state of dental sleep medicine practice at the United States and Canada academic institutions.

Methods: An electronic survey created in Qualtrics was sent via email. The survey was sent to the 76-dental academic institute in the United States and Canada, 16 of which were known to have a dental sleep medicine clinic. The survey was emailed to the program directors of the sleep medicine clinics at these dental schools. For the remaining 60 schools the survey was instead sent to the academic dean. The 21-multiple choice item survey was validated and received IRB approval. Descriptive statistics (counts and percentages) were calculated. SPSS version 24 was utilized.

Results: The response rate was 37% (28 schools), of which 86% were located in the United States. Of the respondents, 45% (12 schools) had a dental sleep medicine clinic. The dental sleep medicine clinics were either independent/ part of diagnostic services (42%) or incorporated with other departments. Nearly (33%) of the schools that have a sleep medicine clinic, reported difficulty integrating sleep medicine into other existing programs. Lack of administrative support or space for clinic and staffing and billing issues are the reported reasons for that difficulty. Eighty-three percent respondents reported the presence of 1-2 board certified dental sleep medicine faculty members, while the remaining schools did not have any.

Conclusion: This present study indicates that Dental Sleep Medicine is faced with many obstacles that need to be addressed. Dental Sleep Medicine is a growing field that needs more attention from educational institutes. Also, it can be noted the positive effect of having

board-certified dental sleep medicine faculty. To help the growth of Dental Sleep Medicine strategies such as increased collaboration among faculty members, and an interdisciplinary approach between departments in the dental clinic might be implemented. This will lead, eventually, to improve patient care in the long run.

DEDICATION

This work is dedicated to my family, without their love, care and financial support it would not have been achieved, and to my sister who taught me the love of reading and respect for education.

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My sincere gratitude to my principal investigator Dr. Correa and my committee members, Dr, Mehta, Dr. Pagni, Dr. Antonellou and Dr. Doherty for their great amount of support and wisdom.

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LIST OF ABBREVIATIONS

CPAP: Continuous Positive Air Pressure

PAP: Positive Air Pressure

OSA: Obstructive Sleep Apnea

SRBDs: Sleep-Related Breathing Disorders

UPPP: Uvulopalatopharyngoplasty

PSG: Polysomnography

HSAT: Home Sleep Apnea Test

CE: Continuing Education

The Current State of Dental Sleep Medicine Practice in Academic Institutions: A Questionnaire-Based Study

Introduction

Sleep disorders, such as obstructive sleep apnea (OSA), have a deleterious effect on quality of life, not to mention sleep. OSA, a common sleep disorder, is characterized by the blockage of airflow during sleep and includes snoring and daytime sleepiness as its most common symptoms. Several studies indicate that sleep deprivation can lead to the development of cardiovascular disease and diabetes by altering the hormonal balance, glucose regulation and increased inflammatory markers and blood pressure [1-3]. Primary care physicians are keen to screen, identify and properly refer OSA patient. Previous studies have focused largely on the physician's education and attitude regarding sleep disorders [4-9].

Sleep-related disorders have also been consistently associated with periodontal disease, [10, 11]. OSA has also been linked to cardiovascular disorders such as coronary artery disease, stroke, heart attacks, congestive heart failure, atrial fibrillation, ventricular arrhythmias, impaired quality of life and increased mortality. Additionally, there is an association between increased lack of sleep and increased incidence of motor vehicle accident [12-19].

The field of somnology/sleep medicine, however, is minimally discussed in dental schools, particularly at the pre-doctoral level [20]. An editorial from 2006 titled "Sleep Disorders and Sleep Deprivation: An Unmet Public Health Problem" reported that an estimated 50 to 70 million Americans have some type of sleep disorder and that these disorders, untreated, pose a significant public health threat. An increased incidence of diabetes, heart attack, and

obesity are all associated with sleep disorders and can be debilitating if not handled appropriately [21].

Current gaps in education and research regarding disorders of sleep and wakefulness can be playing an under-recognized role in the rise of metabolic disorders, contributing to a higher economic burden for the population. In one study, the investigators concluded that strategies to increase awareness of dental sleep medicine and the importance of treating sleep-related disorders can play a significant role in advancing patient care [5,8]. These strategies include incorporating interdisciplinary dental sleep programs in academic hospitals, establishing a clinical network for sleep medicine research, and starting new research training programs across the spectrum of somnology/sleep medicine.

Results from a survey show the current level of medical education as it relates to sleep and sleep disorders in New Zealand and Australian medical schools are somewhat lacking. Surveyed schools reported that an average undergraduate time of 4.5 hours was devoted to dental sleep medicine and appeared to be concentrated in the fifth year of school; 2 out of 6 schools included dental sleep medicine in the second year with a mean of only 0.33 hours [22].

Screening patients for OSA and other sleep-related breathing disorders (SRBDs) is an important aspect of the care offered by dental professionals. Dental professionals can play a pivotal role in reducing OSA prevalence, resulting in possibly reducing patient morbidity and mortality. This may be accomplished by routinely screening and treating patients for

SRBDs; however, newer dental students receive a less-than-adequate level of education regarding screening importance [23]. Dental schools require a greater level of sleep education than what is currently available due to the ability of disorders to drive periodontal disease, cardiovascular disease, and other metabolic and endocrinological health issues [24-29].

A retrospective, 2-year follow-up study by Ivanoff CS and Pancratz F examined whether or not screening protocols (as well as education on the importance of screening) had improved at a US dental school since 2011 [25]. Although screening did improve over a 2-year period, there were still some areas of screening that require further refinement. Their study highlights the fact that education regarding the screening and management of sleep disorders should be incorporated throughout pre-doctoral and postdoctoral training to a greater degree than it is currently in an effort to advance patient care [14].

The role of dental sleep medicine in the educational curriculum of dental schools has been scrutinized more closely these past few years, thanks in part to the increased awareness of sleep disorders and their association with oral health. Although education on SRBDs has improved in dental schools, the level at which it can help future dentists effectively treat patients with these disorders remains up for debate [1].

A lack of medical education regarding sleep disorders isn't just specific to the United States. The nature and extent of sleep medicine education provided by medical schools were investigated by many researchers. The results indicated that medical students and primary

care physicians do not have the necessary knowledge and clinical skills regarding sleep disorders management. Inadequate curricular hours, resources, teaching staff and facilities might be the causes of such deficiency [23-24]. A study by Talaat, AlRozzi, and Kawas found that an average of 1.2 hours was devoted to dental sleep medicine in the Middle East medical schools, a time not efficient enough to train future physicians to screen and treat patients with sleep-related disorders. Considering that these disorders are relatively high in this population group, incorporating further education measures in these schools is crucial for reducing patient morbidity in Middle Eastern countries [26].

Dental sleep medicine has slowly assumed various organizational structures within academic institutions, creating greater awareness of the practice. Sleep disorders such as obstructive sleep apnea and snoring, decrease the quality of life and contribute to a number of health disorders and diseases [1-3]. Thus, improving the quality and increasing the practice of dental sleep medicine at the academic institution level may be vital for reducing the overall morbidity and mortality in the population [30, 31].

In 2003, Ivanhoe et al. reported that 18 of 43 dental educational facilities in the United States confirmed that they teach and manage upper airway disorders. For those 18 schools teaching hours averaged to 2.5. It is worth noting that 25 of the 43 dental schools (58%) stated that there is no time in their curriculum to teach sleep disorders. Additionally, merely six of the 18 schools reported teaching dental sleep medicine to the pre-doctoral students, five of 18 at taught sleep medicine to the post-doctoral students, and the remaining seven dental schools taught sleep medicine to both pre- and postdoctoral students [32].

Currently, the level of dental sleep medicine practice in academic institutions is unclear. The Presidential Task Force of the Sleep Research Society Surveys of 2009 and 2012 indicate that there is currently a lack of strong, cohesive, and independent structures in academic institution administrative departments for the practice of dental sleep medicine. In turn, this has potentially resulted in growth stagnation of dental sleep medicine education, research, and practice [2]. In general, predoctoral dental students are not sufficiently trained to diagnose and manage this OSA [33,34].

Numerous reasons exist as to why there is currently an absence, or a severe deficiency, in dental sleep medicine practice at academic institutions. Challenges, such as achieving a multidisciplinary approach and collaboration with sleep physicians or similar work within the same institution by faculty members and may require significant improvement of institutions' organizational structure [35-37].

The infrastructure disparity in many academic institutions may be contributing to the prevention of the development of dental sleep medicine practices into a uniformed and unified field. Additionally, many faculty members find it difficult to meet one another to discuss the challenges and advances of dental sleep medicine. This potential lack of communication and collaboration among dental schools and sleep centers might affect the growth of dental sleep medicine practice. In addition, current faculty members in academic institutions find that optimal care for sleep apnea patients are lacking as many of these patients remain undiagnosed, and poorly managed for their sleep-related issue(s). This may

be related to the need for increased awareness among faculty members and administrative personals in dental schools [4].

Strategies to improve the level of dental sleep medicine practice at the academic institutions may include incorporating dental sleep medicine education into the curricula, motivating and supporting faculty members to develop an interdisciplinary approach between departments within their own dental schools, and establishing a clinical network with sleep centers and physicians to potentially incorporate a dental sleep medicine clinic in their institutions [5].

The practice of dental sleep medicine, as well as the science behind its function, represents a somewhat new discipline. The emergence of mandibular advancement devices research has partly contributed to the rise of dental sleep medicine practice at the academic institution, although the level at which dental sleep medicine is practiced in this setting remains unknown. There is a need to understand the challenges encountered in the development of dental sleep medicine clinics, current protocols, guidelines, quantity and quality of dental sleep medicine practice at the academic institution, as this information may assist develop a more rigorous and dispersed program aimed at further improving overall patient care.

Therefore, we seek to examine dental sleep medicine practice at the academic institution level and to determine whether current practice is sufficient to meet the needs of both dental professionals and patients. Additionally, we will evaluate the level of dental sleep medicine education and research at current institutions. Potentially, this study may provide information

on the areas of improvement needed as well as assist in the development and implementation of greater dental sleep medicine practices at academic institutions.

Aim

The aim of this study was to assess the current state of dental sleep medicine practice in The United States and Canada academic institutions.

Significance

The significance of this survey study was to identify the challenges encountered in the development of dental sleep medicine practice in academia. This will serve to provide strategies and potentially protocols for the implementation of dental sleep medicine practice in more dental schools.

Methods

A total of 76 US and Canada dental schools were surveyed in this study. An electronic survey was utilized and send via email. To the 16 schools known to have a dental sleep clinic, the email was sent to the director or faculty member of the dental sleep clinic. The academic dean was approached with the survey in the remaining 60 schools which did not have a dental sleep clinic. Qualtrics was used for sending the electronic survey via email. The survey had 21 multiple choice items, some items required an optional written response (Appendix C).

Content Validity: To test for content validity, three dental sleep specialists were given the survey. Each individual was given the opportunity to rate each question individually using the five-point Likert scale (1=very important, 2=important, 3=moderately important, 4=of little importance, and 5=not important). In addition, they were asked to rate whether the questions should be included in the survey (0=no, 1=unsure, 2=yes). Regarding face validity, dental sleep medicine specialists were included. However, academic deans, directors and staff members of a sleep medicine clinic were excluded.

Face Validity: To test for face validity, three independent faculty members of dental sleep programs reviewed the survey to ensure that questions are easily understood, simple, useful and necessary. These individuals were not being asked to complete the questionnaires but were asked to offer their opinions on each question. They were asked whether they were comfortable answering the questions, had any trouble with the questions, and if they had any additional feedback.

Inclusion Criteria for Face Validity: Dental sleep medicine specialist.

Exclusion Criteria for Face Validity: Academic Dean of any US and Canada dental schools

Dental sleep medicine clinic director/faculty members.

Any changes to the survey, the updated survey was submitted to the IRB before the distribution. The survey was distributed via link/ email to the all designated academic deans or dental sleep clinic directors/faculty member. The Qualtrics survey platform was used for this study.

Recruitment:

Face Validity Recruitment: Recruitment was done via email.

Content Validity Recruitment: Recruitment was done via email.

Survey Recruitment: For academic deans, the academic dean was identified through a web search and emailed. For dental sleep clinic directors/faculty member, the PI had a list of directors/faculty member who emailed

Risk: This study poses minimal risk to subjects as no identifying information was collected that is linked to the survey responses. Risk kept to a minimum by following the procedures under the confidentiality section.

Location of Research Activities: Tufts University School of Dental Medicine,

Confidentiality: Email addresses that are publicly available or known to the PI was used. Once the data is collected, any list of the email addresses deleted. There was no link between the surveys (answers) and the individual respondents.

Data Storage: Tufts BOX was utilized to store all of the study information. All information kept electronically password protected.

Statistical Analysis

Descriptive statistics (counts and percentages) were calculated. SPSS version 24 was used.

Results

Thirty-seven percent (28/76) of dental schools surveyed in North America responded to this survey. Of the dental schools responding to the survey, 86% (24/28) were located in the United States (Figure1). Among the 86% (24/28) dental schools in the United States, 4 (16.67%) were from Northeast region, 5 (20.83%) from Southeast, 4 (16.67%) from Midwest, 5 (20.83%) from Southwest, and 6 (25%) from the Western region. Seventy-five percent of respondents (21/28) were affiliated to the public university and 25% (7/28) to a private university.

Twenty-seven survey responders answered whether their institution had a dental sleep medicine clinic. Among the respondents, 45% (12/27) had a dental sleep medicine clinic at their institution while 55% (15/27) did not (Figure 2). The dental sleep medicine clinics were incorporated in the department of orofacial pain and temporomandibular disorder 42%, (5/12), orthodontics 8%, (1/12), and oral medicine at 8%, (1/12). In addition, 42% (5/12) stated that dental sleep medicine clinics were either independent of any department or part of diagnostic services, facial pain and dental sleep clinic, advanced care center, or department of diagnostic sciences (Figure 3).

Forty-two percent (5/12) of respondents did not report any challenges with implementing the dental sleep medicine program at their institution while 25% (3/12) stated not having a sufficient number of faculty members trained in dental sleep medicine. Other challenges

stated by 33% (4/12) included difficulty integrating into existing programs, lack of administrative support or space for the clinic, and staffing and billing issues (Figure 4). Eighty three percent respondents (10/12) reported 1-2 board certified dental sleep medicine faculty members while 17% (2/12) stated the presence of no board-certified dental sleep medicine faculty members at their institution (Figure 5).

Of the 12 institutions with dental sleep medicine clinic, 50% (6/12) stated that only faculty members treated patients and the other 50% (6/12) stated both faculty and residents treat patients.

Regarding the source of patient referrals to the school's sleep clinic, 83% (10/12) respondents stated that they get their patient referrals from sleep centers. Nearly 91% (11/12) of the respondents indicated that their referrals came from sleep physicians. 75% (9/12) from within the dental school, 41% (5/12) from dentists, and 16% (2/12) stated their patient referral source as others including area internists, or cardiologists, ENTs etc (Figure 6).

One hundred percent of respondents (12/12) stated that they use custom fabricated an adjustable oral appliance, while 25% (3/12) reported using prefabricated and adjustable oral appliance. In addition, 17% (2/12) and 33% (4/12) used temporary and tongue retainer devices, respectively.

Regarding the type of combination therapy offered to the patients, 75% of responders (9/12) indicated that they offer combination therapy of mandibular advancement device with either

positive airway pressure (PAP) or positional therapy to their patients. Only 17% (2/12) of respondents stated that they offer a tongue-retaining device with PAP therapy to their patients.

Regarding techniques utilized to minimize side effects, of the 12 respondents, 92% (11/12) stated that they use techniques to minimize bite side effects while 8% (1/12) did not. In addition, 75% (9/12) stated that they provided the technique to minimize bite side effects at the time of sleep oral appliance delivery while 25% (3/12) provided the technique as needed if the patient developed bite side effects.

Regarding their protocol schedule for short-term follow-up visits, of the 11 respondents, 36% (4/11) stated follow up visits every 2 weeks and 36% (4/11) stated every 4 weeks. In addition, 27% (3/11) respondents stated other follow up schedules including initial follow up at 2 weeks after delivery of device followed by every 4 weeks for the first 3 months or initial follow at 2 weeks after delivery of device followed by a visit at 2-3 months until resolution of subjective symptoms.

Regarding the schedule for long-term follow up visits, of the 11 respondents, 64% (7/11) stated follow up visit at 6 months and 1 year after completion of therapy, 9% (1/11) stated follow up visits as needed, and 27% (3/11) stated other schedules such as every 1 year.

Among the 11 respondents indicating how many patients are scheduled monthly, 91% (10/11) scheduled 5-15 new patients monthly while 9% (1/11) scheduled 1-5 new patients monthly. Of the 11 responders to question 20, 45% (5/11) stated that less than 10% of patients were lost to follow-up, 18% (2/11) stated lost to follow up of 10-20% of patients, and 36% (4/11) stated lost to follow up of > 20% patients.

Sixty-three percent of the respondents (7/11) stated that they used polysomnography (PSG) to confirm treatment efficacy, 26% (5/11) used home sleep apnea test (HSAT), 10.5% (2/11) assessed treatment efficacy based on patient's feedback, and 26% (5/11) used other techniques such as cardiopulmonary coupling or referral back to the sleep physician for evaluation and possible HSAT or PSG per their recommendation.

Ninety-one percent respondents (10/11) to the question of having continuing education program, had (CE) programs in dental sleep medicine at their institution while only 9% (1/11) percent did not have continuing education programs in dental sleep medicine (Figure 7). Of the 10 respondents, on the frequency of dental sleep CE courses, 60% (6/10) stated that courses were offered every 10-12 months, 20% (2/10) stated every 4-6 months, and 10% (1/10) each stated every 1-3 months or every 7-9 months (Figure 8).

Regarding whether the dental sleep CE course offered at their institution was a minimum of 25 hours. 60% (6/10) respondents felt that the CE course was not a minimum of 25 hours while 40% (4/10) felt that it was a minimum of 25 hours (Figure 9).

Discussion

Several studies have indicated that there is no systematic method to improve clinician practices and/or patient outcomes in dental sleep medicine [38,39]. In the present study, only 37% (28/76) of dental schools responded to the survey and the majority of them were located in the United States. Regarding the data obtained from this survey, only 45% (12/28) had dental sleep medicine clinic at their institution. This finding highlights the lack of widespread dental sleep medicine practice at academic institutions.

Consistent with the findings of dental Sleep Research Society surveys of 2009 and 2012 indicating a paucity of independent structures in administrative departments of academic institutions for the practice of dental sleep medicine, the dental sleep medicine clinics were located in various departments including orofacial pain and temporomandibular disorder, orthodontics etc [2]. Due to the absence of a defined organizational structure for dental sleep medicine clinics, respondents stated other challenges such as integrating into existing programs, administrative and billing issues etc. Similarly, a questionnaire-based study by Almohaya et al [40] identified two difficulties to increase the time for sleep medicine education: 53% stated that the topic did not have high priority, while 47% indicated that there is no insufficient time to teach the topic. In a Study by Mindell et al. in which 12 countries were surveyed and these difficulties were recorded: insufficient time, a lack of trained staff and resources, low priority and irrelevance [41]. It is alarming to notice that sleep medicine did not get priority like other topics, and therefore, understaffed with no sufficient funding.

Interestingly, the majority of respondents stated the presence of 1-2 board certified dental sleep medicine faculty members at their institution. This indicates a trend towards growing importance and presence of dental sleep medicine departments at academic institutions. Strategies such as increased collaboration among faculty members, and interdisciplinary approach between departments in the dental clinic may further aid in the development of a strong dental sleep medicine program.

Also, the majority of respondents reported the presence of continuing education programs at their institution with courses being offered at least once a year, show growing level of involvements in dental sleep medicine practice and education at academic institutions. However, many respondents 60% (6/10) felt that the courses offered were less than 25 hours. Hence, increasing the frequency and duration of continuing education courses on dental sleep medicine could further improve the dental sleep medicine practice. This study suggests that the emergence of mandibular advancement devices have contributed to the rise of dental sleep medicine practice. In line with those findings, many respondents stated that they offer a combination therapy of mandibular advancement device with either positive airway pressure (PAP) or positional therapy to their patients.

The limitations of this study being limited to the United States and Canada, with the electronic questionnaire other dental schools in Australia and Europe could have been included. The other limitation was not supplementing the electronic questioner with a paper one, and that might have affected the response rate.

To this date, the American Dental Education Association and the Council on Dental Accreditation did not create and implement foundational educational protocols for Dental Sleep Medicine in the United States.

Conclusion

The results suggest that academic institutions consider the dental sleep medicine topic an important topic to be included in their curriculums. In addition, respondents stated the presence of board-certified dental sleep medicine faculty had a positive impact on their program. The study suggests that strategies such as increased collaboration among faculty members, and an interdisciplinary approach between departments in the dental clinic may further aid in the development of a strong dental sleep medicine program. As a result, increased treatment provided by dental sleep medicine as a standard of care in dentistry.

We speculate that with the recent development of dental sleep medicine practice guidelines by the American Academy of Dental Sleep Medicine (AADSM) and the collaboration between academic institutions and professional associations the practice and teaching of dental sleep medicine in academia will continue to growth globally.

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APPENDICES

Appendix A: Tables.

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Appendix F: Follow-up letter to Academic Dean.

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Appendix A: Figures

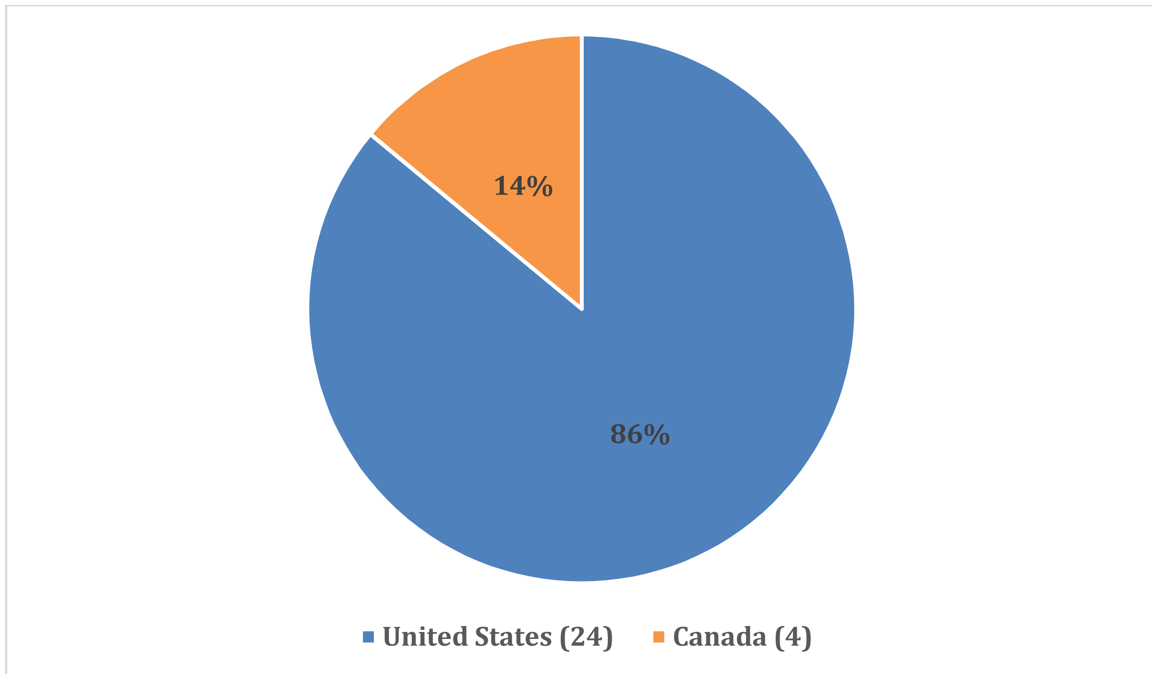

Figure 1: Distribution of dental schools in North America.

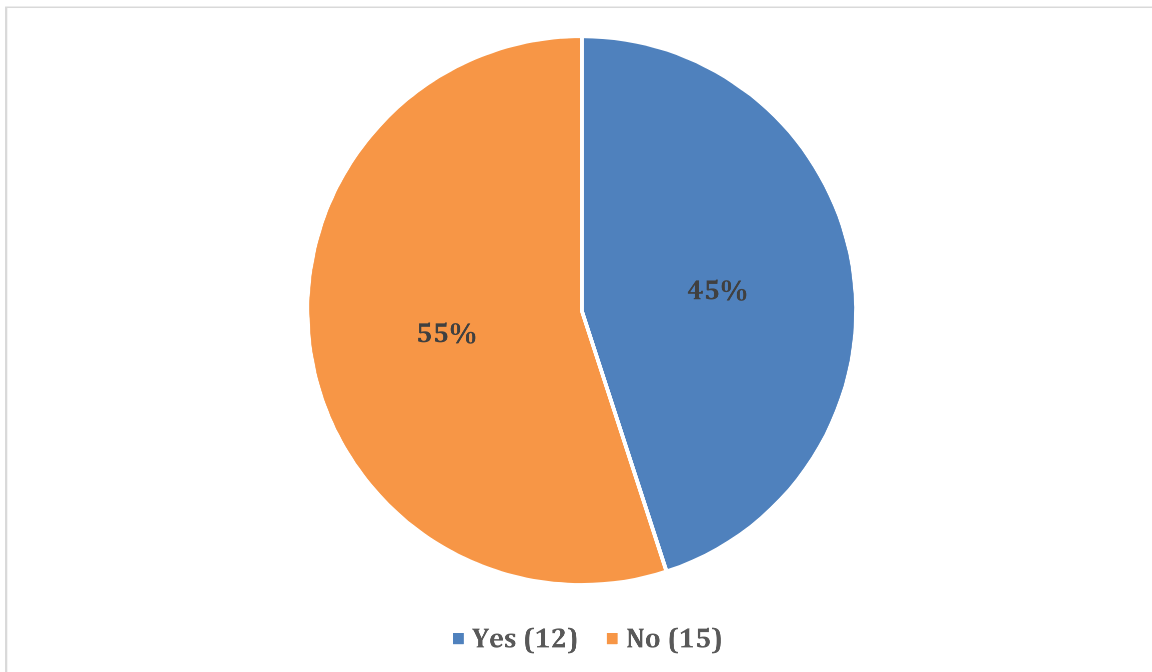

Figure 2: The presence of dental sleep medicine clinic.

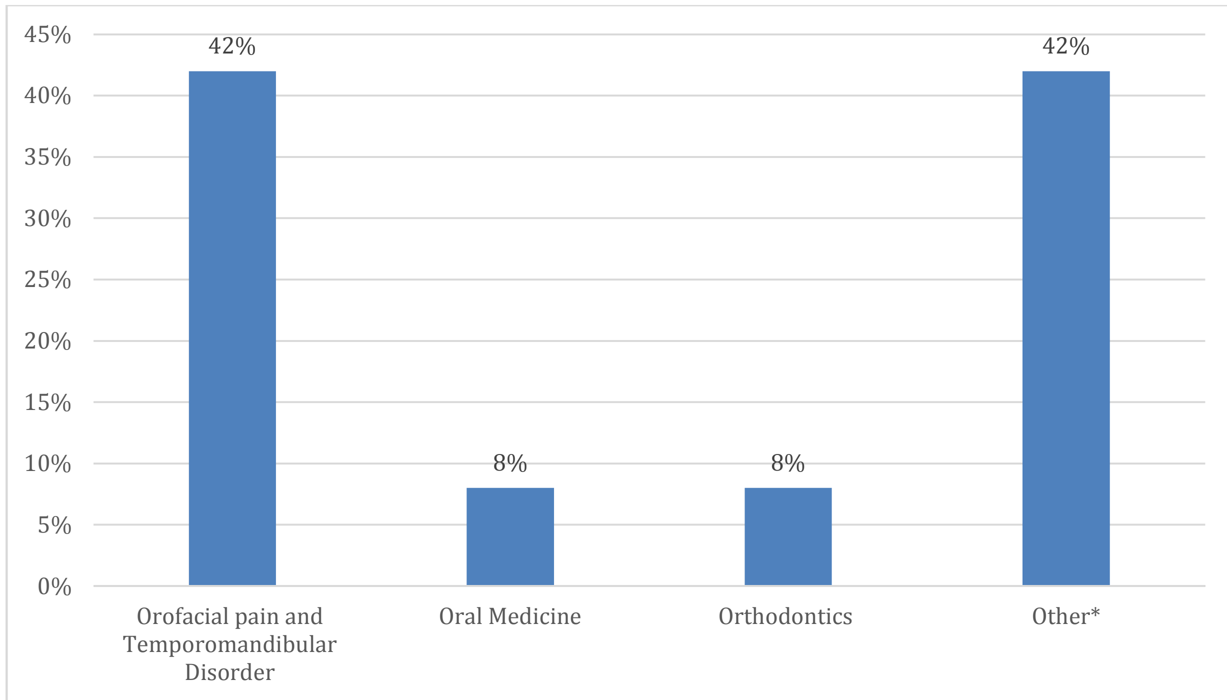

Figure 3: Departments that sleep medicine clinic is integrated with.
*Other: Diagnostic Services, Facial pain & sleep clinic, Advanced Care Center, Independent of any department and Department of Diagnostic Sciences

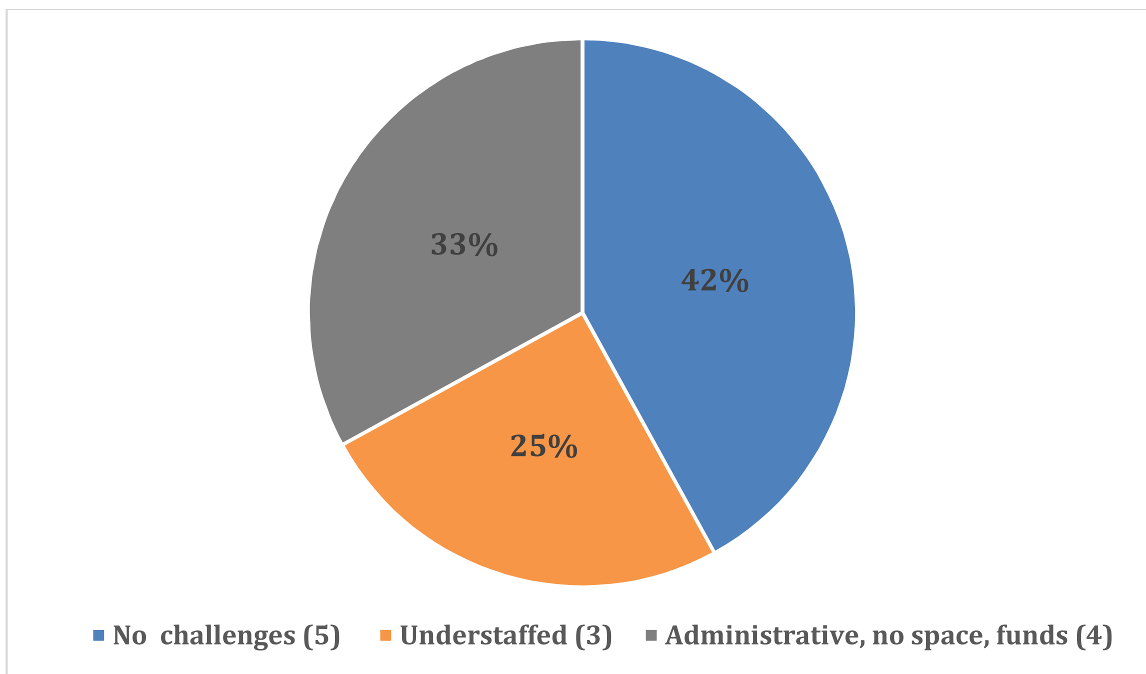

Figure 4: Challenges in implementing a dental sleep medicine clinic.

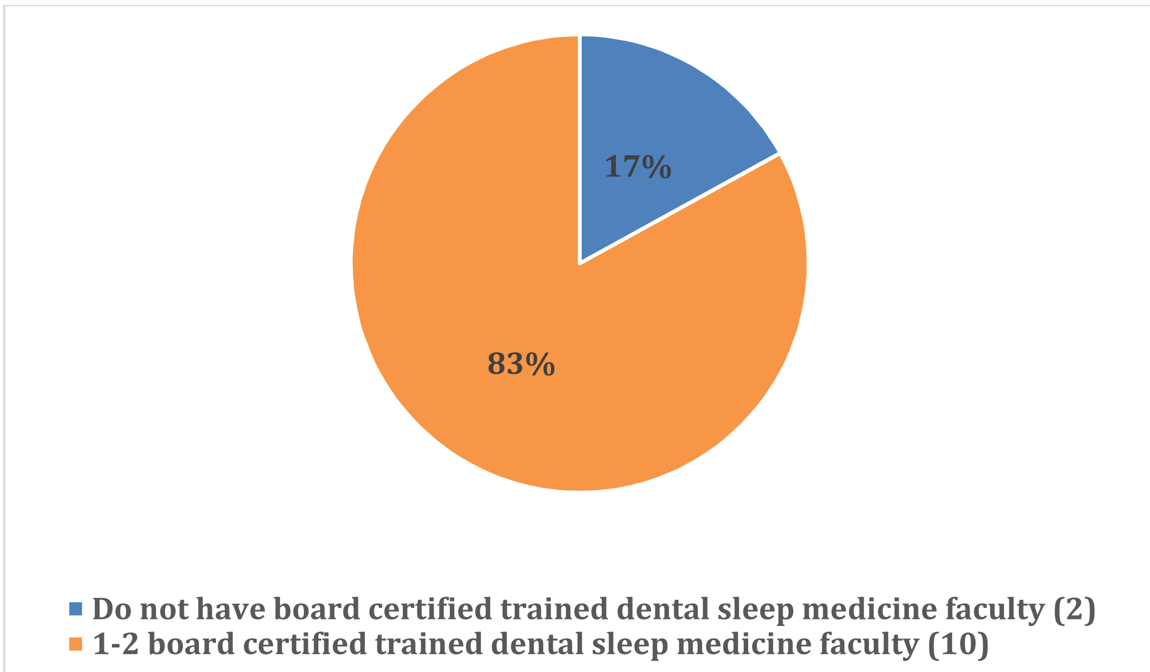

Figure 5: The presence of board certified trained dental sleep medicine faculty members.

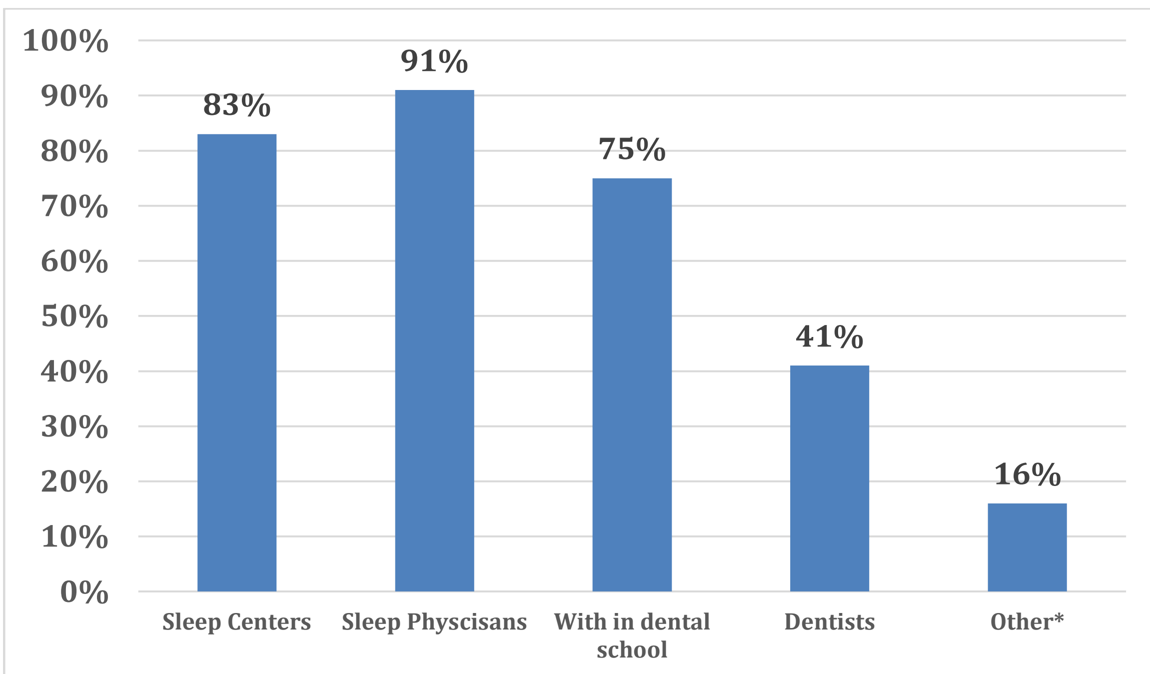

Figure 6: Patient referral sources.
Other*: Area internists, cardiologists, ENTs, self-referred etc.

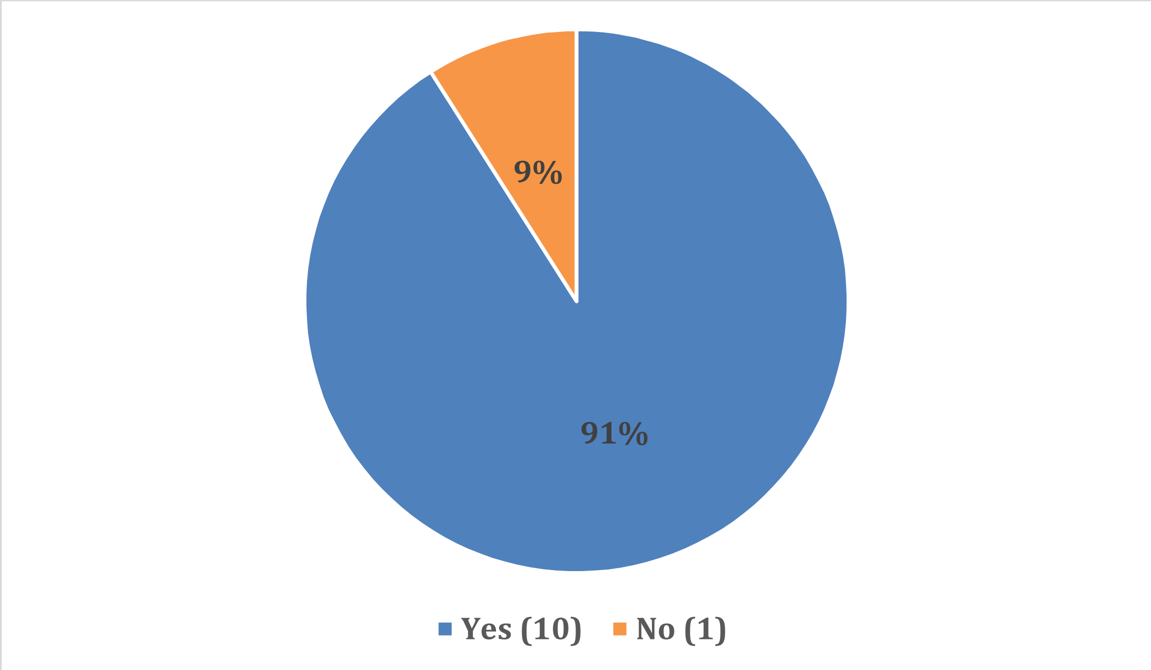

Figure 7: The presence of continuing education (CE) programs in dental sleep medicine.

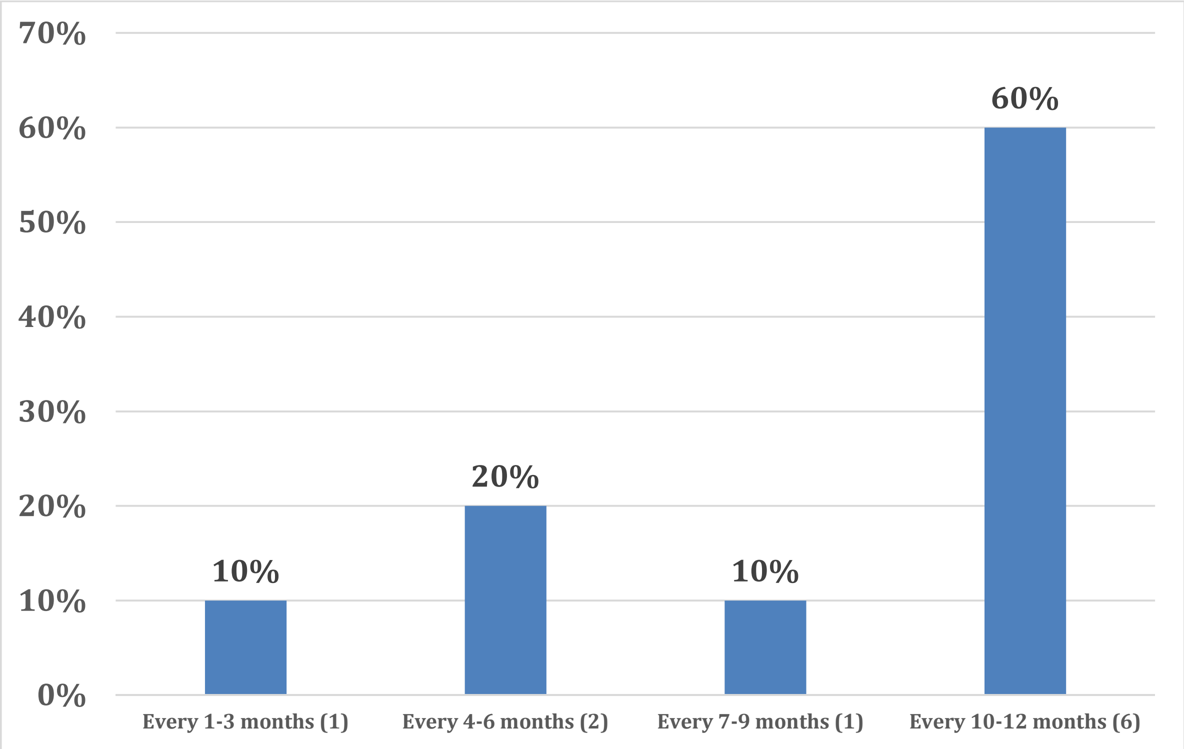

Figure 8: Frequency of sleep CE course offerings.

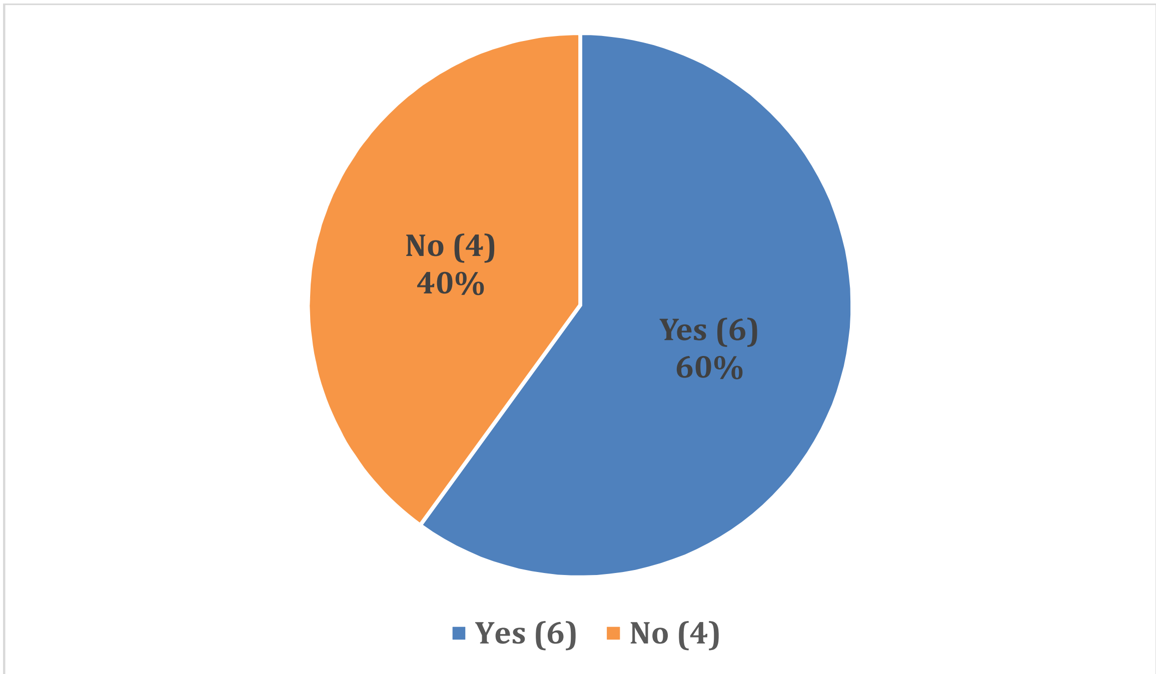

Figure 9: A minimum of 25 hours in the dental sleep CE course(s) program.

Appendix B: Survey

The Current State of Dental Sleep Medicine Practice in Academic Institution: A Questionnaire-Based Study

Questions:

1. What country is your school in?
    a) Canada
    b) United States

If Canada chosen, skip to question 3.
If US chosen, go to question 2.

2. What geographic region is your school in?
    a. Northeast
    b. Southeast
    c. Midwest
    d. Southwest
    e. West

3. Is your university private or public?
    a. Private
    b. Public
    c. Other (please specify)

4. Do you have a Dental Sleep Medicine Clinic at your institution?
    a. Yes
    b. No

If answer is yes, go to question 5.
If answer is no, survey will end.

5. Provide the name of the department where the clinic is incorporated
    a. Orofacial pain and Temporomandibular Disorder
    b. Endodontics
    c. Orthodontics
    d. Prosthodotics/ Preventive and Restorative Science
    e. Pediatric Dentistry
    f. Oral Surgery
    g. Oral Medicine
    h. Periodontics
    i. Other (please specify)

6. What challenges did you have implementing a dental sleep medicine clinic at your institution?
    a. Administrative approval/support

b. Space for the clinic
c. Not a sufficient number of faculty members trained in dental sleep medicine
d. No challenges
e. Other (please specify)

7. How many board certified trained dental sleep medicine faculty members are at your institution?
   a. 1-2
   b. 3-5
   c. more than 5

8. Who treats patients at the dental sleep medicine clinic in your institution?
   a. Faculty only
   b. Faculty and residents
   c. Faculty, residents, and dental students

9. Where do you get your patient referral source? (select all that apply)
   a. Sleep centers
   b. Sleep Physicians
   c. Within the dental school (referral from other clinics)
   d. Dentists
   e. Other (please specify)

10. What type of oral appliance design do you use? (select all that apply)
    a. Custom fabricated and adjustable
    b. Prefabricated and adjustable
    c. Temporary devices
    d. Tongue retainer devices

11. What type of combination therapy is offered to your patients? (select all that apply)
    a. Mandibular advancement device and positive airway pressure (PAP) therapy
    b. Tongue retaining device and PAP therapy
    c. Mandibular advancement device and positional therapy
    d. None

12. What type of technique do you use to minimize bite side effects? (select all that apply)
    a. Morning (AM) aligner
    b. Jaw exercises
    c. Muscle stretching exercises
    d. Morning repositioning device

13. When do you provide the technique from the previous question?
    a. Provided at the time of sleep oral appliance delivery
    b. As needed if patient develop side effects
    c. Other (please specify)

14. What is your protocol schedule for follow up visits?
    a. Every 2 weeks
    b. Every 4 weeks
    c. Every 6 weeks
    d. Other (please specify)

15. What is your schedule for long term follow ups?
    a. 6 months and yearly after completion of therapy
    b. As needed
    c. Other (please specify)

16. How many patients are scheduled monthly?
    a. 1-5
    b. 5-15
    c. 15-30
    d. more than 30

17. What percentage of patients are lost to follow up in your patient population?
    a. Less than 10%
    b. 10%- 20%
    c. More than 20%

18. What follow up method do you use to confirm treatment efficacy?
    a. Polysomnography
    b. Home Sleep Apnea Test
    c. Patient's feedback
    d. Others (please specify)

19. Does your institution have continuing education (CE) programs in dental sleep medicine?
    a) Yes
    b) No

If yes, go to question 19.
If no, the survey will end.

20. How often are sleep CE courses are offered?
    a) Every 1-3 months
    b) Every 4-6 months
    c) Every 7-9 months
    d) Every 10-12 months

21. Is your dental sleep CE course(s) program a minimum of 25 hours?
    a. Yes
    b. No

Appendix C:

Survey Recruitment to Academic Dean

Subject: Academic Deans of US/Canada Dental Schools

Dear Academic Dean XXXX,

You are invited to participate in a research study at Tufts University School of Dental Medicine (TUSDM) being conducted by Principal Investigator Dr. Leopoldo P. Correa, B.D.S, M.S. A survey is being administered to the academic dean in 60 dental schools across the United States and Canada. The survey has been created to assess current state of dental sleep medicine practice in United States and Canada academic institutions. This information will help us to identify the challenges encountered in the development of dental sleep medicine practice in academia. This will serve to provide strategies and potentially protocols for the implementation of dental sleep medicine practice in more dental schools.

You will be answering a brief 21-question survey that will take no more than 5 minutes in total. These surveys will be emailed to the academic dean of each US and Canada dental schools. No compensation will be provided for participating in this study.

Your participation in this study is voluntary, and there are no personal benefits to your participation. Participation or the refusal to participate will not affect faculty employment status at your institution. There is no risk of participating in this study as no identifying information will be collected that is linked to the survey responses. Your email address will not be used or published in any way; only the answers from each survey will be used to obtain results. Once the answers have been recorded, any identifying information on paper format will be shredded, and any digital formats will be deleted. Individual responses will be kept confidential and will not be disclosed to any outside parties. All data collected will be stored in a password protected computer or a locked cabinet.

This study has been reviewed by the Tufts Social, Behavioral and Educational Research Institutional Review Board (IRB). If you have any questions, comments or concerns, please contact the principle investigator directly at leopoldo.correa@tufts.edu or (617) 636-3421.

If you have questions about the rights of research subjects, please contact the Institutional Review Board Administrator at (617) 627-3417.

LINK TO SURVEY: (insert here)

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Associate Professor and Division Head, Dental Sleep Medicine
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Tufts University School of Dental Medicine
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leopoldo.correa@tufts.edu

Appendix D:

Survey Recruitment to faculty member dental sleep medicine clinic

Subject: Faculty member dental sleep medicine clinic of US/Canada Dental Schools.

Dear faculty member XXXX,

You are invited to participate in a research study at Tufts University School of Dental Medicine (TUSDM) being conducted by Principal Investigator Dr. Leopoldo P. Correa, B.D.S, M.S. A survey is being administered to the faculty member of dental sleep medicine clinic in 16 dental schools across the United States and Canada. The survey has been created to assess current state of dental sleep medicine practice in United States and Canada academic institutions. This information will help us to identify the challenges encountered in the development of dental sleep medicine practice in academia. This will serve to provide strategies and potentially protocols for the implementation of dental sleep medicine practice in more dental schools.

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Appendix E:

Follow-up letter

Subject: REMINDER: Academic Dean of US/Canada Dental Schools XXXX

Dear Academic Dean XXXX,

Two weeks ago, you received an email with an invitation to participate in a research study being conducted at Tufts University School of Dental Medicine (TUSDM). I wanted to take a moment to let you know that the survey is still open for responses. As a reminder, the goal of this survey to assess current state of dental sleep medicine practice in United States and Canada academic institutions. This information will help us to identify the challenges encountered in the development of dental sleep medicine practice in academia. This will serve to provide strategies and potentially protocols for the implementation of dental sleep medicine practice in more dental schools.

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Appendix F:

Follow-up letter

Subject: REMINDER: Faculty member of dental sleep medicine clinic in US/Canada Dental Schools XXXX

Dear faculty member XXXX,

Two weeks ago, you received an email with an invitation to participate in a research study being conducted at Tufts University School of Dental Medicine (TUSDM). I wanted to take a moment to let you know that the survey is still open for responses. As a reminder, the goal of this survey to assess current state of dental sleep medicine practice in United States and Canada academic institutions. This information will help us to identify the challenges encountered in the development of dental sleep medicine practice in academia. This will serve to provide strategies and potentially protocols for the implementation of dental sleep medicine practice in more dental schools.

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