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Dental Sleep Medicine among dental practitioners: Preliminary findings from the National Dental Practice-Based Research Network

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Abstract:

Objectives/Introduction: Dental sleep medicine (DSM) focuses on oral appliance therapy (OAT) to manage sleep-disordered breathing (SDB), including obstructive sleep apnea (OSA). This brief poll aimed to assess the interest and practices of dental practitioners in DSM. To this day lack of data exists regarding how DSM practices function in the clinical setting. Therefore, identifying knowledge gaps in DSM among dental practitioners may improve patient outcomes.

Methods: A preliminary brief questionnaire (“Quick Poll”) on DSM was conducted through the National Dental Practice-Based Research Network (Network) members (n=311). The poll contained five questions about DSM.

Results: Results showed that 66% of practitioners have involvement in DSM patient care. A total of 44% of practitioners who answered the Quick Poll do not screen for snoring or SDBs. About 40% of respondents are either interested in continuing education courses on the topic or had already taken multiple courses on DSM. The top three topics of DSM research of interest to practitioners were various DSM practice models, response to OAT, and compliance with OAT.

Conclusion: Network dental practitioner respondents face challenges regarding the treatment of SDBs. Despite these challenges, most practitioners are interested in engaging in DSM. Based on these preliminary findings, there are informational needs regarding the current state of clinical care, side effects of OAT, choice of OAT, titration protocols, and patient outcomes.

Keywords: Dental Sleep Medicine (DSM), Sleep-disordered breathing (SDB), Obstructive Sleep Apnea (OSA)

Introduction:

As the profession of dentistry has gradually expanded its scope of practice, growth in the interest in dental sleep medicine (DSM) has emerged. DSM was defined in 2008 by the American Academy of Dental Sleep Medicine (AADSM) as “an area of

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dental practice that focuses on the use of oral appliance therapy (OAT) to treat sleep-disordered breathing (SDB), including snoring and obstructive sleep apnea (OSA)".¹ Eight years later an alternate definition was proposed by Lobbezoo et al. defining DSM as "the discipline concerned with the study of the oral and maxillofacial causes and consequences of sleep-related problems".² Some of these sleep-related problems include, and are not limited to, orofacial pain, gastro-esophageal reflux disorder (GERD), bruxism, insomnia, narcolepsy, xerostomia, and manifestations including sleep disturbance or excessive sleepiness.³

Men have a higher prevalence, 49.7%, of moderate-to-severe SDB, according to a 2015 study by Heinzer et al.⁴ One of the most prevalent sleep-related breathing disorders is OSA^{5,6} which is commonly described as a cessation of breathing during sleep as a result of airway collapse⁷ consisting of a repetitive obstruction of the upper airway that causes apneas.⁸ Over the last few years, the prevalence of OSA has been exponentially increasing, with estimates ranging from 9 to 38% of the global population.⁹ An estimated 54 million Americans are affected¹⁰ by OSA, with 80% of the cases remaining undiagnosed.¹¹ This can lead to severe economic costs, including motor vehicle accidents, comorbidities, substance, tobacco, and alcohol abuse, decreased productivity at work, reduced quality of life (QoL), and stress on interpersonal relationships.^{12,13} These undiagnosed cases cost the US around \$149.6 billion in 2015.¹¹ Thus, there is a need for treatment to reduce the health burden associated with untreated OSA.⁵

The most significant gaps in the diagnosis and treatment of SDB are signs and symptoms recognition. Bian, in a 2004 survey (n=192), observed that 58% of general dentists did not know the signs and symptoms associated with OSA, and approximately half did not know about the use of OAT to treat OSA.¹⁴ Moreover, almost all respondents agreed that OSA is a life-threatening illness in that same study.¹⁴ A survey conducted in 1997 by Loube and Strauss (n=124), concluded that the lack of standardization in the use of OAs for OSA treatment was problematic.¹⁵ These results suggest a deficiency in the education received about DSM, including during predoctoral and postdoctoral studies.

A study in 2003 by Ivanhoe et al. reported that about 42% of the U.S. dental schools that responded to their survey teach about upper airway disorders but only dedicate around 2.5 hours to the topic.¹⁶ The remaining 58% of responding schools in this study stated that they had no available curriculum time to teach about sleep disorders.¹⁶ A study by Karimi et al. utilized a survey questionnaire sent out to North American Dental Schools, 37% or 28/76 of which responded. Of these 28 schools, 12 reported having a dental sleep medicine clinic, and among those, 7 schools faced challenges in implementing a dental sleep medicine clinic due to issues with administration, space, funds, and understaffing.¹⁷

The "Quick Poll" informal survey discussed in this paper aimed to collect descriptive data about DSM among members of the National Dental Practice-Based Research Network (Network). Specific topics included the assessment, diagnosis, and

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treatment of DSM. The mission of the Network is to improve oral health by conducting dental practice-based research and serving dental professionals and their patients through education and collegiality.¹⁸ One of the ways that the network uses to engage its members is through Quick Polls. The Network, through its newsletter, sends out these Quick Polls to address different topics and interests among its members. The Network can establish a baseline to gauge its members' interest in various topics from the data collected to expand further research and better understand the challenges its members face.

Methods:

In February 2021, a Quick Poll on DSM was conducted by the Network. "Quick Polls" are done by the network as a simple, low-cost means to engage network members in clinical topics of interest, expecting that findings from these preliminary polls will inform the design of a subsequent, rigorously-designed, full-scale clinical study that the network might conduct later. A single invitation to complete the poll is sent to network members. No follow-up of non-respondents is done because all data are captured in anonymous fashion, making it impossible to identify who responded. The Network has conducted over 50 Quick Polls based on topics in which practitioners have expressed interest. Although responses to Quick Polls are not linked to members' identifiers, they offer an easy way for members to give input about ideas for Network studies. Practice-based research network (PBRN) study ideas often come from the practitioners in a bottom-up approach to study selection.¹⁹ To our knowledge, the National Dental PBRN is the only Network that successfully uses Quick Polls to gauge interest in future study topics.

The PBRN "Quick Poll" goal was to compile a sense of members' involvement in DSM, using a five-question questionnaire (See Appendix) sent through the Network's newsletter, using the following criteria:

1. Current involvement in Dental Sleep Medicine
2. Practice Demographics and Screening Practice
3. Interest in Dental Sleep Medicine

This Quick Poll was sent to the Network's active members (5,104 at the time of the Poll), of whom approximately 20% are not clinically active dentists or dental hygienists (this includes office staff, students, residents, retired or no longer practicing practitioners, and others).

The study conforms to recognized standards of the US Federal Policy for the Protection of Human Subjects. The Institutional Review Board (IRB) approval was obtained from the University of Alabama at Birmingham, IRB-040903006, The National Dental PBRN Administrative & Resource Center.

Results:

From all the Network's members who received the newsletter, a total of 311 responded to the Quick Poll (6%).

Results from the Quick Poll suggest that 66% of the respondents have some type of involvement in DSM, from which only 2 respondents' practice is solely focused on DSM. Moreover, roughly one-third of the respondents do not provide any DSM service. Interestingly, 4% of respondents state that they receive patients referred from primary care physicians for DSM, while 6% receive patients referred by sleep physicians. **(Figure 1)**

The majority of respondents (68%) see both adults and children in their practice but only a quarter (24%) screen for SDBs, leaving about one-third (32%) who do not do any form of screening for SDBs. Of the practices that saw only adults, 54% screen for SDBs. For practices that only see children (17 respondents), around 60% screen for SDBs. **(Figure 2)**

In gauging interest in the topic of DSM, the Quick Poll found that 41% of respondents were quite interested but had not taken continuing education (CE) courses on the topic. Another 39% have already taken multiple courses on DSM. A few (15%) were not interested in DSM, and only 11 respondents were already certified DSM specialists. DSM is not a recognized specialty by the American Dental Association (ADA); however, AADSM CE courses are recognized by the ADA Continuing Education Recognition Program (ADA CERP).²⁰ **(Figure 3)**

The Quick Poll attempted to identify the concerns of practitioners regarding providing DSM services. Responders could choose multiple concerns they found applicable in their practice setting. The top five most common issues identified were: insurance/ medical billing issues (47%), lack of patients' knowledge on sleep hygiene/ sleep medicine (38%), side effects of OAT (33%), predicting good responders to OAT (33%), and concerns with the effectiveness of oral appliance (30%). **(Figure 4)**

Finally, the practitioners were asked about topics of interest for PBRN studies related to DSM. The majority were interested in DSM research, and the top three topics were: various practice models of dental sleep medicine (42%), responders to oral appliance therapy (34%), and compliance to oral appliance therapy (33%). **(Figure 5)**

Discussion:

The Quick Poll results suggest that dental practitioners face challenges regarding screening and treating OSA patients. Despite these challenges, most respondents are interested in engaging in DSM. As of today, there is only one AADSM-recognized fellowship program in the US that focuses on Dental Sleep Medicine offered to

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postdoctoral dental students.²¹ Despite the lack of formal academic-based training, organizations such as the AADSM provide many programs to develop DSM expertise, and there are many opportunities in the field, including collaboration with sleep physicians by aiding in identifying referring patients at risk for sleep-disordered breathing, especially OSA. Another untapped opportunity is training dental students who are receiving little to no education on the know-to and how-to of screening for sleep-related breathing disorders.¹⁷

The dental office is an ideal setting for identifying such patients and potentially providing treatment once a sleep physician accurately diagnoses the patient. Providing education for dentists to screen for OSA is a first step in allowing more dentists to become part of the treatment process. Given that insurance/medical billing issues were the number one cited concern, some research focusing on reducing insurance/medical billing barriers would be recommended. Based on the findings of this PBRN survey, there are informational needs that may be met with further research regarding the current state of clinical care, including factors that affect OAT, specifically appliance choice, titration protocols, and patient outcomes. In addition, there are no published guidelines that clinicians and dentists can refer to for the management of side effects associated with OAT.²² Individual lectures are the primary source of information available to clinicians, which may lead to bias; as such, these knowledge gaps truly need to be addressed.²²

This study's findings are in line with previous related research. Although Loube and Strauss (1997)¹⁵ and Bian (2004)¹⁴ both conducted formal surveys on OAT for OSA in contrast to our more informal Quick Poll, the results we obtained were very similar, reflecting the gaps in knowledge which then translate to practice. This is especially important to consider when dentists have much to offer in terms of potentially successful alternative treatment to OSA's public health concern. Some common findings that emerged from Bian's results were lack of familiarity with the upper airway, lack of knowledge of signs and symptoms of OSA, and mandibular advancement treatment or OAT.¹⁴ In addition, Bian's survey respondents were more similar to this current study as they sent out surveys to general dentists, in contrast to Loube's, which targeted members of the Sleep Disorders Dental Society.¹⁵

A few similar studies were identified upon expanding the search to our European counterparts. Vuorjoke-ranta and colleagues surveyed general dentists and dental specialists in Helsinki, Finland (n=134) regarding their knowledge of OSA and their willingness to screen for and treat it.²³ They found that the level of knowledge is crucial for success treatment of OSA and highlight the importance of a collaboration between the dentist and sleep physician.²³

In 2021, Leigh and collaborators also set out to understand the knowledge in sleep-related breathing disorders among general dental practitioners in the UK.²⁴ A total of 152 general dentists responded to their survey, which revealed findings that slightly differed from ours in that more than half of the respondents actually screen for SDB in their dental practices. Leigh et al. found that UK general practitioners have a theoretical knowledge of SBDs, but this may be due to their interest in the topic.²⁴ Agreeing with

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our findings, their respondents believed that more information is needed regarding dental sleep medicine for general dentists.²⁴ It was also recognized that there was a deficiency in predoctoral education about upper airway disorders.²⁴

Moreover, Berggren et al. focused on patient care for patients with risk of oral health problems linked to OSA.²⁵ This study was a qualitative focus group interview of dentists and hygienists with experience in the Swedish Dental Public Service. Once again, the experts they interviewed agreed that coincide with other studies, that more education about OSA should be imparted to dental professionals.²⁵

Although none of the European studies revealed barriers in terms of medical insurance etc., the recurring theme was clear. Together, they demonstrate that there is a gap to be filled regarding education, predoctoral, and postdoctoral, when it comes to upper airway disorders, specifically OSA, as it relates to dental sleep medicine.

In November 2016, the Network did a Quick Poll on OSA, with 420 participants. In this Quick Poll, preliminary data found that one-third of dentist professionals do not screen for OSA, and around 40% ask about sleep apneas in their questionnaires. From these preliminary data, less than half of the respondents screened for sleep apnea, with one-fifth of the respondents waiting for their patients to bring it up. Based on our latest poll, this problem still exists, as OSA is still the most prevalent sleep-related breathing disorder with a significant number of undiagnosed cases. Therefore, collaboration between dental professionals and physicians is key in diagnosing and treating OSA. Although currently, the standard treatment of OSA is continuous positive airway pressure (CPAP), OAT shows comparable outcomes and better compliance. If left untreated, OSA may result in poor long-term health outcomes.

This study has some limitations. The average response rate from previous Networks' Quick Polls has been approximately 9%. In this study, we obtained a 6% response rate. The observed decrease in response rate may be partially attributed to the COVID-19 pandemic. Also, this poll is directed at a niche dental professional population interested in the practice of DSM, which could cause selection bias because perhaps persons were much more likely to have responded if they were interested in the topic. Furthermore, the results presented here are merely preliminary data highlighting the huge knowledge gap in DSM, as only a third of our 311 participants reported exposure to DSM.

A low response rate is seen when comparing our study limitations with previous studies. Although focused on a particular state, Bian's study was the first attempt to grasp the knowledge among general dentists regarding OSA. They explain that the lack of familiarity with the issue resulted in their low response rate.¹⁴ Upon considering our study and its low response rate, one should also consider the differences in methodology, i.e., no follow-up contacts occurred, no subjects were solicited formally, and how it tried to capture a national sample.

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In conclusion, based on available literature and the results of this Quick Poll, much work needs to be put into DSM education and research. Important topics that need to be addressed include how DSM is practiced in the dental offices across the US, identifying the phenotype of individuals who suffer from SDBs, and creating more avenues for training and educating predoctoral and postdoctoral dental students.

Abbreviations:

1. AADSM – American Academy of Dental Sleep Medicine
2. ADA – American Dental Association

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3. ADA CERP – American Dental Association Continuing Education Recognition Program
4. CPAP – Continuous Positive Airway Pressure
5. DSM – Dental Sleep Medicine
6. GERD – Gastro-esophageal reflux disorder
7. Network – National Dental Practice-Based Research Network
8. OAT – Oral Appliance Therapy
9. OSA – Obstructive Sleep Apnea
10. PBRN – Practice-Based Research Network
11. QoL – Quality of Life
12. SDB – Sleep-disordered breathing

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Figures:

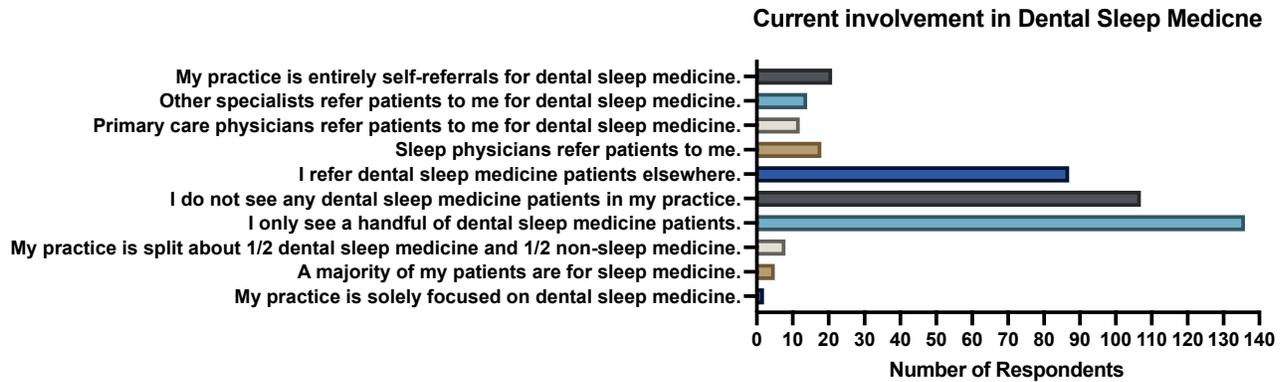


Figure 1. Current Involvement in Dental Sleep Medicine. Bar chart illustrating involvement of respondents in dental sleep medicine.

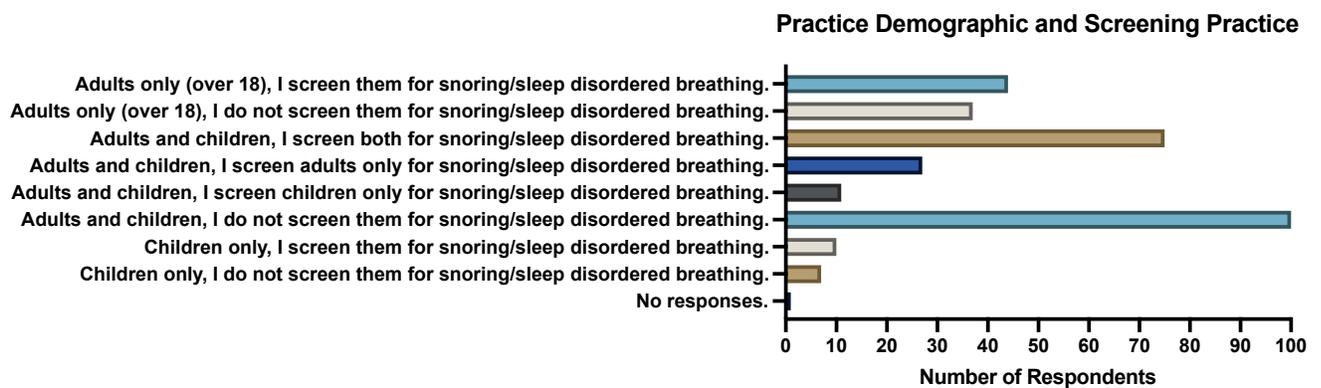


Figure 2. Practice Demographic and Screening Practice. Bar chart illustrating practice age demographics as well as screening practice.

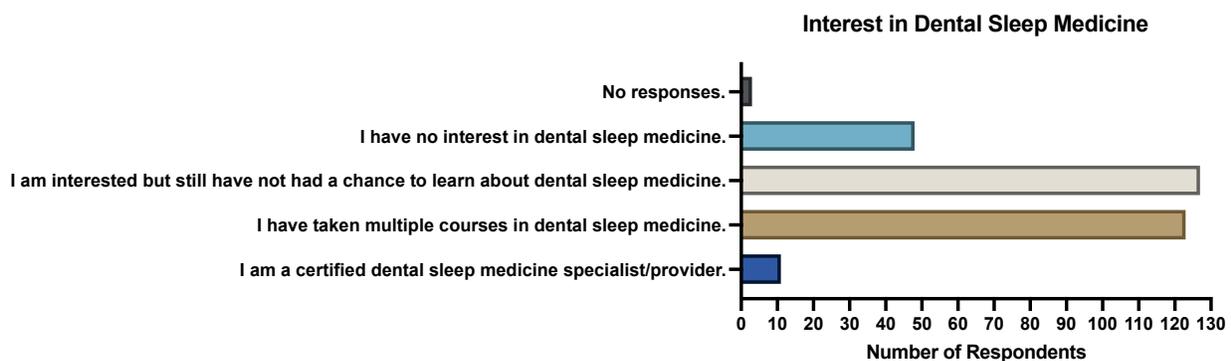


Figure 3. Interest in Dental Sleep Medicine. Bar Chart illustrating degrees of interest in dental sleep medicine.

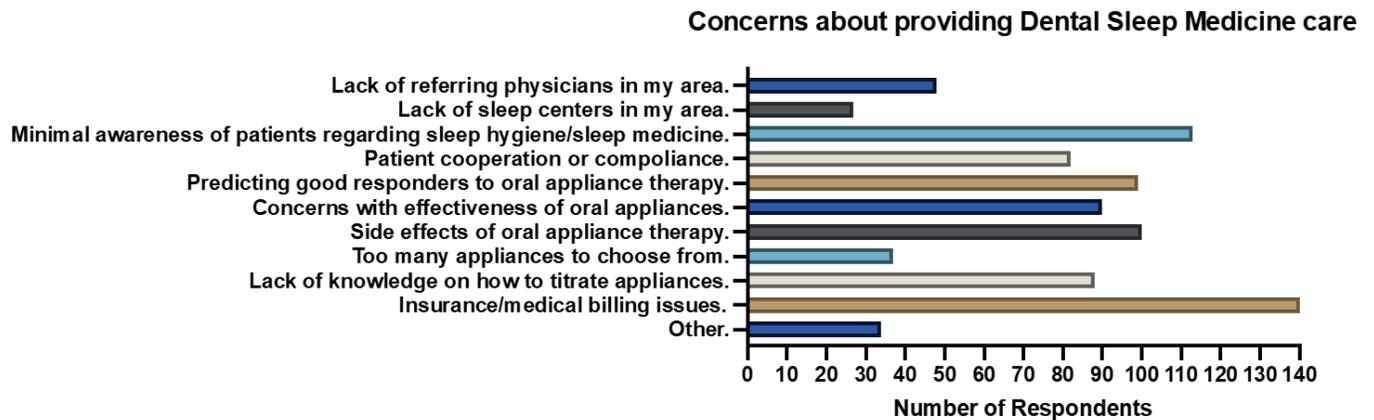


Figure 4. Concerns about providing Dental Sleep Medicine care. Bar chart illustrating practice age demographics as well as screening practice.

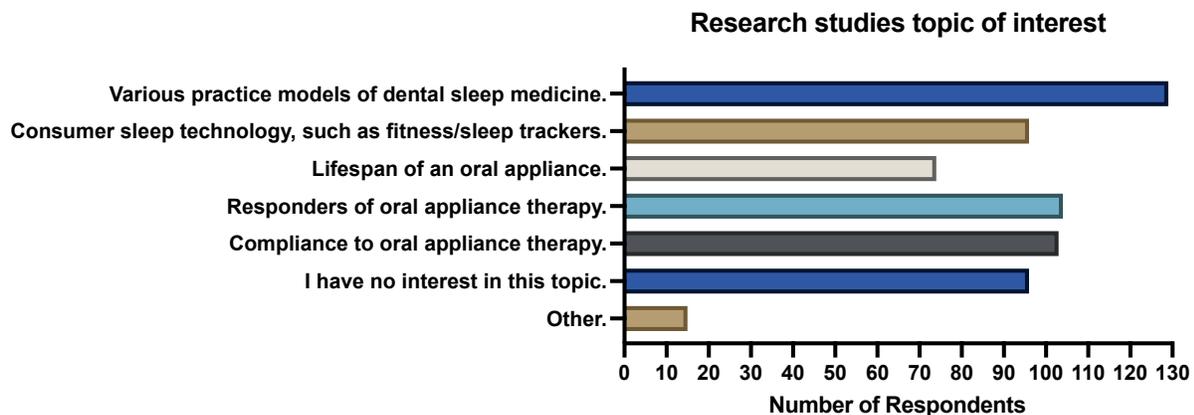


Figure 5. Research studies topic of interest. Bar chart illustrating practice age demographics as well as screening practice.

Appendix:

National Dental PBRN Quick Poll on Dental Sleep Medicine

1. What best describes your current involvement in dental sleep medicine? (Please select ALL THAT APPLY.)
 - My practice is solely focused on dental sleep medicine.
 - A majority of my patients are for sleep medicine.
 - My practice is split about 1/2 dental sleep medicine and 1/2 non-sleep medicine.
 - I only see a handful of dental sleep medicine patients.

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- I do not see any dental sleep medicine patients in my practice.
 - I refer dental sleep medicine patients elsewhere.
 - Sleep physicians refer patients to me.
 - Primary care physicians refer patients to me for dental sleep medicine.
 - Other specialists refer patients to me for dental sleep medicine.
 - My practice is entirely self-referrals for dental sleep medicine.
2. What is your practice age demographic and screening practice? (Please select ONE answer only.)
- Adults only (over 18), I screen them for snoring/sleep disordered breathing.
 - Adults only (over 18), I do not screen them for snoring/ sleep disordered breathing.
 - Adults and children, I screen both for snoring/ sleep disordered breathing.
 - Adults and children, I screen adults only for snoring/ sleep disordered breathing.
 - Adults and children, I screen children only for snoring/ sleep disordered breathing.
 - Adults and children, I do not screen them for snoring/ sleep disordered breathing.
 - Children only, I screen them for snoring/sleep disordered breathing.
 - Children only, I do not screen them for snoring/ sleep disordered breathing.
 - No Responses
3. Please describe your interest in learning about dental sleep medicine (please select ONE answer only.)
- I am a certified dental sleep medicine specialist/ provider.
 - I have taken multiple courses in dental sleep medicine.
 - I am interested but still have not had a chance to learn about dental sleep medicine.
 - I have no interest in dental sleep medicine.
 - No Responses
4. What problems, if any, are you most concerned about in providing dental sleep medicine care to your patients? (Please select ALL THAT APPLY.)
- Lack of referring physicians in my area
 - Lack of sleep centers in my area
 - Minimal awareness of patients regarding sleep hygiene/sleep medicine
 - Patient cooperation or compliance
 - Predicting good responders to oral appliance therapy
 - Concerns with effectiveness of oral appliances
 - Side effects of oral appliance therapy
 - Too many appliances to choose from
 - Lack of knowledge on how to titrate appliances
 - Insurance/ medical billing issues

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- Other
5. For which dental sleep medicine topics below would you be interested in participating in research studies? (Please select ALL THAT APPLY.)
- Various practice models of dental sleep medicine
 - Consumer sleep technology, such as fitness/sleep trackers
 - Lifespan of an oral appliance
 - Responders to oral appliance therapy
 - Compliance to oral appliance therapy
 - I have no interest in this topic
 - Other