

Evaluation of Current Screening and Treatment Patterns for Pediatric Obstructive Sleep Apnea Among Practicing Pediatric Dentists in the United States: A Pilot Study

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Abstract: ***Purpose:** The purpose of this study was to provide an evaluation of educational experience, screening, referral, and treatment patterns by pediatric dentists in the United States with regards to obstructive sleep apnea (OSA) and sleep-disordered breathing (SDB). **Methods:** A twenty-six question, multiple choice, electronic survey was developed using SurveyMonkey software. It was distributed to the 6,017 active American Academy of Pediatric Dentistry (AAPD) members, garnering a response rate of 7.0 percent. **Results:** A total of 41.2 percent of respondents were uncomfortable or very uncomfortable screening for OSA/SDB; 61.4 percent indicated no formal training in OSA/SDB during residency; 40.7 percent stated they routinely screened for OSA/SDB; and 93.9 percent referred to a physician in suspected cases of OSA/SDB. **Conclusions:** While awareness of OSA and SDB is high among pediatric dental specialists, educational opportunities are limited, routine screening is not standard, and treatment is not commonly provided. (Pediatr Dent 2016;38(5):393-7) Received December 8, 2015 | Last Revision June 29, 2016 | Accepted June 30, 2016*

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Obstructive sleep apnea (OSA) and sleep-disordered breathing (SDB) have long been recognized as significant health threats within the community. The far-reaching impacts of these conditions extend beyond associated medical comorbidities, as they ultimately compromise quality of life. Although the long-term implications of these conditions have historically been described in detail, it has not been until fairly recently that the extensive nature of population level effects in adults has been elucidated by health care providers and the general public. A growing body of research, greater awareness, and more sensitive diagnostics have revealed that approximately one out of every 20 adults is impacted with OSA syndrome (OSAS).¹ Unfortunately, even with growing awareness and education, a great many cases will remain undiagnosed and untreated.

While OSA and SDB remain important areas of concern among the adult population, awareness within the pediatric population is even more limited. As research has progressed, health care providers have become increasingly appreciative that OSA and SDB are also important issues among children, adolescents, and teens. As defined by the International Classification of Sleep Disorders (third edition), “pediatric OSA is characterized by intermittent complete or partial obstruction (obstructive apnea or hypopnea); prolonged partial upper airway obstruction; or both prolonged and intermittent obstructions that disrupt normal ventilation during sleep, normal sleep patterns, or both.”²

Studies seeking to assess the prevalence of these issues among the pediatric population have revealed that OSA occurs in between one and four percent of this group.^{3,4} As a result, screening and treatment for OSA/SDB within the pediatric population has become a priority for health care professionals.

In 2012, the American Academy of Pediatrics (AAP) issued an updated guidance statement advising that all patients should be screened for OSA, and those with positive findings should be referred for appropriate diagnosis/treatment.⁵ As a result of these recent AAP recommendations, it is critical that dental practitioners begin to more carefully focus on the issues of OSA/SDB and provide appropriate screening, referral, and treatment where indicated.

A number of studies across the dental and medical literature have looked at the relationship between various orthodontic treatment modalities, airway resistance, tongue posture, upper airway morphology, and craniofacial growth and development.⁶⁻¹² The results of these studies have yielded an understanding that orthodontic treatments, particularly those that produce orthopedic changes (rapid palatal expansion), may play a role in the treatment of OSA/SDB by changing the anatomical relationships of the upper airway.⁶⁻¹² Consequently, pediatric dentists, orthodontists, and other dental practitioners not only play an important role in assessing patients with OSA/SDB, but also in helping to provide adjunctive treatments. As a result, it is critical that we have a strong appreciation of the current practice and educational patterns surrounding the issues of OSA and SDB.

Therefore, the purpose of this study was to provide a robust and comprehensive evaluation of the educational experience, screening, evaluation, referral, and treatment patterns currently present among pediatric dentists in the United States regarding obstructive sleep apnea and sleep-disordered breathing.

Methods

After receiving approval from the Institutional Review Board of A.T. Still University, Mesa, Ariz., USA, the proposed survey was submitted to the American Academy of Pediatric Dentistry (AAPD) for separate approval before distribution. The electronic survey was developed through SurveyMonkey (Palo Alto, Calif., USA) and distributed to the AAPD registry of active members in the form of a web link. Clicking on the link led users to an online survey consisting of 26 questions written in

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a multiple-choice format. The survey was divided into five sections: (1) demographics; (2) confidence and training; (3) screening procedures; (4) referral patterns; and (5) treatment modalities.

Respondents were provided a list of responses from which they were asked to choose the most appropriate response or responses for each question. In addition, participants were given the option of adding their own comments in cases where the multiple-choice answers were insufficient. Participation was completely voluntary and anonymous, with no user information linked to the respondent's identity. The final data were compiled and examined using Microsoft Excel software v16.4.1 (Microsoft Corp., Redmond, Wash., USA).

Results

For the 2015 fiscal year, there were 6,017 active AAPD members. At the time of initial survey distribution, 358 active members responded. A follow-up email to remind members to participate in the survey resulted in 63 additional responses. Due to the dramatic decline in participants for the first follow-up email, a second follow-up was deemed unnecessary, since it would have been unlikely to increase participation by any appreciable amount. As a result, the 421 total respondents translated to a seven percent response rate.

Table 1. RESPONDENT DEMOGRAPHICS	
Gender	%
Male	45.7
Female	54.3
Age (ys)	
<30	14.1
30-39	25.9
40-49	24.0
50-59	19.2
60>	16.8
Ys in practice	
0-5	29.9
6-10	11.7
11-20	24.2
21-30	16.0
30>	18.2
Practice setting	
Metropolitan (>500,000)	33.5
Large city (50,000-500,000)	33.0
Small city (20,000-50,000)	26.7
Rural (<20,000)	6.8
Employment status	
Multi-doctor practice	40.9
Academics/hospital-based practice	24.1
Single practitioner	21.6
Multispecialty practice	10.9
Corporate practice	2.5

Demographics. Survey demographics are summarized in Table 1. Respondents ranged in age from younger than 30 years old to over 60 years old, with age distribution following a relatively balanced pattern. Responses by females outnumbered those of males by 8.6 percent. All strata of time in practice were well represented, with those in practice zero to five years being the most prevalent, followed by 11 to 20 years, 30 or more years, and 21 to 30 years. Those in practice six to ten years were the least represented, with only 11.7 percent of respondents coming from this group. Respondents reported having completed residency over a range from 1972 to 2017. Most respondents (60.5 percent) held current certification by the American Board of Pediatric Dentistry; 39.3 percent did not, and 0.2 percent previously held certification but no longer do.

Confidence and training. In the next section of the survey, respondents focused on educational experience and confidence in evaluating pediatric patients for OSA/SDB. Respondents were asked to characterize their confidence in screening for OSA/SDB in their pediatric patients, with a scale ranging from five (very comfortable) to one (very uncomfortable). Survey participants expressed a range in confidence in screening, with 9.3 percent rating themselves as very comfortable, 21.4 percent stating they were comfortable, 28.1 indicating they were somewhat comfortable, 20.1 percent stating they were somewhat uncomfortable, and 21.1 percent indicating that they were very uncomfortable in screening for OSA/SDB (Figure 1). Survey participants were also asked to characterize their comfort in providing treatment for pediatric OSA/SDB patients, with 53.8 percent being very uncomfortable, 17.7 percent being uncomfortable, 16.1 percent being somewhat comfortable, seven percent being comfortable, and 5.4 percent being very comfortable.

The respondents were then questioned regarding their residency training experience relative to OSA/SDB (summarized in Figure 2). The majority, 61.4 percent, reported no formal instruction, while 24.8 percent indicated that instruction relative to diagnosis was provided, and 12.8 percent were provided with instruction related to both diagnosis and treatment. A much smaller proportion had residency educational experience that related directly to patient care for pediatric OSA/SDB patients. In addition to residency training, respondents were also asked to quantify their continuing education exposure

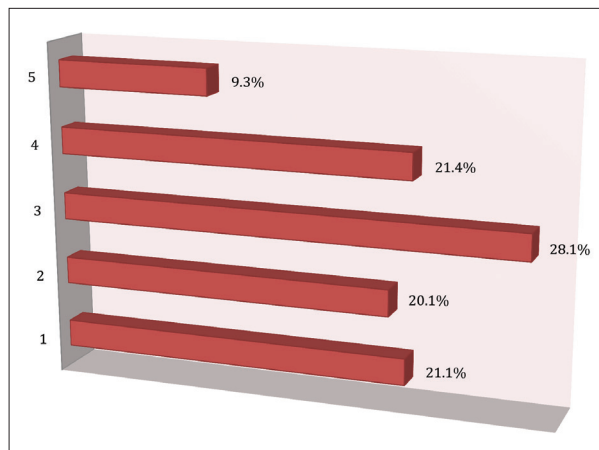


Figure 1. Respondent confidence in screening for obstructive sleep apnea (OSA) or sleep-disordered breathing (SDB) in pediatric patients. (5=very comfortable to 1=very uncomfortable).

relative to pediatric OSA/SDB in the past five years. Most respondents 58.9 percent reported no exposure within the past five years, while some 31.6 percent reported zero to five hours. The remainder indicated five to 10 hours (4.1 percent) and 11 to 20 hours (3.9 percent); only 1.5 percent indicated 21 hours or more.

Finally, the respondents were asked to characterize their desire to learn more relative to the topic of OSA/SDB in pediatric patients from a scale of five (very interested) to one (not interested). The majority of respondents reported having a desire to learn more in relation to this topic, with 33.3 percent being very interested, 25.6 percent interested, 23.8 percent somewhat interested, and 8.9 percent marginally interested. Only 8.4 percent indicated they were not interested in learning more regarding OSA/SDB.

Screening procedures. Another important component of the study focused on pediatric dentists' screening patterns relative to OSA/SDB within their patient population. Respondents were asked whether they routinely screened for OSA/SDB as part of their examination protocol: 40.7 percent reported it as a common practice, while 59.3 percent reported it was not commonly done. Respondents who indicated they routinely screened for OSA/SDB were asked to indicate the screening tools they commonly used. Depicted in Figure 3, verbal questioning was the most common tool, used by 97.4 percent of respondents, followed by a screening form or questionnaire

(39.2 percent) and body mass index (25.5 percent). Cone-beam computed tomography, lateral cephalograms, and home sleep testing units were also used on a less frequent basis.

Table 2 indicates the signs and symptoms most commonly used by pediatric dentists in screening for OSA/SDB. Snoring, gasping, or pauses in breathing while sleeping (98 percent), mouth breathing (91.3 percent), and hyperactivity, inattention, or behavioral problems (70.5 percent), were most frequently reported. Finally, respondents who routinely screened for OSA/SDB in their examination protocols overwhelmingly (97.4 percent) reported tonsil and adenoid screening was a part of this protocol.

Referral. The next phase of the survey focused on referral patterns relative to pediatric patients identified to be at risk for OSA/SDB. Respondents indicated that the vast majority of suspected OSA/SDB cases were referred to medical colleagues for further evaluation (93.9 percent). In addition, respondents stated that ENT/otolaryngology was the most commonly referred to physician subgroup (72.7 percent), followed by pediatricians (67.1 percent) and board certified sleep physicians (7.1 percent). Most survey participants (65.8 percent) reported that they did not have an existing referral relationship for pediatric OSA/SDB referrals, while the remainder reporting they had such a relationship. Finally, Table 3 summarizes the average number of patients annually referred to a physician for OSA/SDB evaluation and/or treatment.

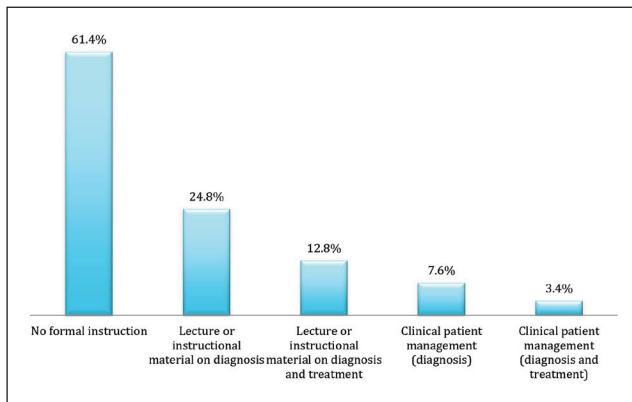


Figure 2. Respondent educational exposure to obstructive sleep apnea or sleep-disordered breathing during residency.

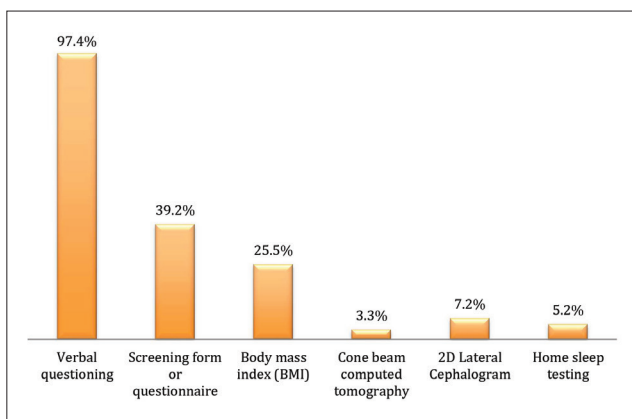


Figure 3. Most common obstructive sleep apnea or sleep-disordered breathing screening modalities used by pediatric dentists.

Table 2. OBSTRUCTIVE SLEEP APNEA AND SLEEP-DISORDERED BREATHING SIGNS AND SYMPTOMS SCREENED FOR BY PEDIATRIC DENTAL SPECIALISTS

Sign/symptom	%
Snoring, gasping, or pauses in breathing while sleeping	98.0
Mouth breathing	91.3
Hyperactivity, inattention, or behavioral problems	70.5
Excessive daytime sleepiness	56.4
Nocturnal enuresis	49.0
Poor academic performance	40.9
Hyponasality	40.9
Night terrors or sleep walking	22.1
Night-time sweating	10.7

Table 3. ANNUAL OBSTRUCTIVE SLEEP APNEA/SLEEP-DISORDERED BREATHING PHYSICIAN REFERRALS BY PEDIATRIC DENTISTS

None	9.9%
1-5	49.3%
6-10	19.3%
11-20	11.9%
21-40	5.4%
>40	4.2%

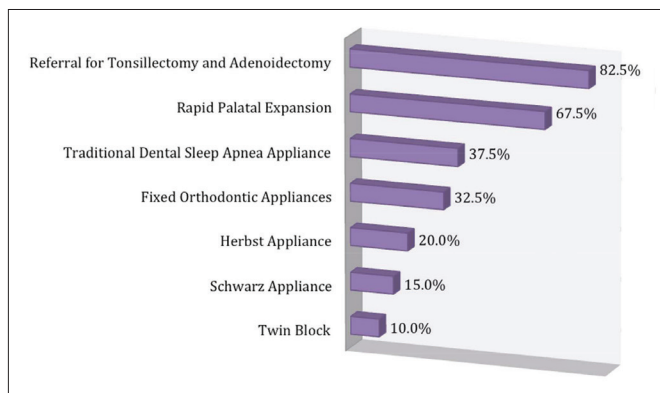


Figure 4. Most commonly used treatment modalities used by pediatric dental specialists for managing obstructive sleep apnea or sleep-disordered breathing.

Treatment. In the final portion of the survey, participants were asked to characterize whether or not they provide any forms of treatment to pediatric patients diagnosed with OSA/SDB. Only a small number of respondents (9.3 percent) indicated they provided treatment within their practices, while the remaining 90.7 percent did not. Respondents treated the maxilla and mandible (56.1 percent), the maxilla only (36.6 percent), and mandible only (7.3 percent). Figure 4 summarizes the different modalities used by practitioners providing OSA/SDB treatment to pediatric patients. The most common treatments indicated were referral for tonsillectomy and adenoidectomy (82.5 percent), rapid palatal expansion (67.5 percent), traditional dental sleep apnea appliances (37.5 percent), and fixed orthodontic appliances (32.5 percent). Finally, survey participants were asked to indicate how they monitor treatment outcomes: 72.2 percent indicated that a questionnaire was used, 44.4 percent referred to a physician for repeat sleep study, and 19.4 percent relied upon home sleep testing.

Discussion

As awareness and understanding of OSA/SDB continues to grow, it is critically important for dental practitioners to develop an adequate understanding of their role as the health care team member most well positioned to address these issues. The importance of collaboration with medical colleagues specializing in sleep medicine cannot be understated. It is a critical component of providing patients with comprehensive diagnosis and treatment. In particular, OSA/SDB among the pediatric patient population has become an important new area of focus, which was previously overlooked. Lumeng and Chervin noted that "Pediatric SDB may represent a major, as of yet poorly addressed, public health burden with many years of potential consequences for affected individuals, their families, and society."¹⁰

An evaluation of the literature found that parent-reported symptoms of SDB are estimated at between four and 11 percent of the pediatric population, while the prevalence of OSA based on diagnostic criteria is between one and four percent within the same group.^{3,4,10} Therefore, it is critical that pediatric dentists, the dental practitioners who routinely evaluate and treat pediatric patients, have a robust understanding of OSA/SDB and take appropriate steps to screen, diagnose, refer, and treat patients with these conditions. Finally, it is imperative for pediatric dental specialists to be aware of the multifactorial

etiology of pediatric OSA/SDB and acknowledge its relationship to other comorbidities including gastroesophageal reflux disease, mucopolysaccharidosis, hypotonia, sickle cell disease, muscular dystrophy, obesity, and craniofacial anomalies.²

The findings in this study indicate a number of important trends in educational experience, screening, evaluation, referral, and treatment patterns currently among pediatric dentists in the United States with regards to OSA/SDB. Pediatric dentists were somewhat mixed concerning their comfort in screening for OSA/SDB in pediatric patients. These findings tend to indicate a wide distribution in comfort level among pediatric dentists in screening for OSA/SDB, and suggest an opportunity to increase awareness and education among practitioners. In addition, pediatric dentists in this study indicated that they generally were not confident in providing treatment for OSA/SDB patients, with the vast majority being either uncomfortable or very uncomfortable. These findings also highlight a great deal of opportunity to educate pediatric specialists in the various modalities available to dental practitioners to participate in the management of OSA/SDB patients to help improve outcomes.

Other findings from this study indicate that training and educational exposures related to OSA/SDB tend to be limited for pediatric dental specialists. The majority of participants reported that they had received no formal training relative to OSA/SDB during their residencies, with little or no hands-on experience. In addition, exposure to continuing education relative to OSA/SDB was also limited among pediatric dental specialists. One encouraging trend was pediatric dentists' strong desire to learn more about diagnosis and management of OSA/SDB patients. From these findings, we can conclude that there is a need for enhanced clinical and didactic exposure to OSA/SDB in pediatric dental residencies going forward, in conjunction with additional continuing education opportunities for practicing pediatric dentists.

When asked to characterize their routine screening of patients for OSA/SDB, pediatric dentists were divided. The majority did not routinely include such screening as part of their examination protocol. This indicates a clear opportunity to increase screening for OSA/SDB as a part routine pediatric dental evaluations in concert with AAP clinical practice guidelines. The most common screening modalities for OSA/SDB used by pediatric dentists included verbal questioning, questionnaires, and BMI. In addition, for those routinely screening for OSA/SDB, evaluation of the tonsils and adenoids was undertaken by nearly all respondents. Together, these findings indicate that routine screening procedures performed by pediatric dentists are consistent with clinical practice guidelines, both sensitive and specific.^{4,11}

The results of this study strongly indicate that pediatric dentists commonly refer patients to physician colleagues for evaluation if OSA/SDB is suspected. Referrals were most commonly made to ENT/otolaryngology specialists and pediatricians. However, the majority of participants in this study did not report having an existing relationship with a physician colleague for the purposes of OSA/SDB referrals. This highlights the importance of collaboration between pediatric dental specialists and their medical colleagues in identifying patients impacted by OSA/SDB in the community. In addition, it emphasizes the importance of interspecialty communication and the development of professional relationships to ensure that the highest quality patient care is provided.

Findings from this study indicate that the vast majority of pediatric dental specialists do not provide dentistry-based OSA/SDB treatment in their practices. In addition, most respondents stated that they did not refer to other dental colleagues for such treatment, with orthodontists being the most common referral. Among the group of pediatric specialists who provide dental OSA/SDB treatment modalities, the most commonly used treatment modalities were referral tonsillectomy and adenoidectomy and rapid palatal expansion (RPE).

While it is important to note that, at present, RPE does not hold FDA approval or universal acceptance as a treatment for OSA/SDB, this study's findings are consistent with a growing body of recent research that indicates a potential synergistic effect when RPE is performed in conjunction with tonsillectomy and adenoidectomy in pediatric OSA/SDB patients.¹⁵⁻¹⁷ Pediatric dentists providing OSA/SDB treatment indicated that a questionnaire was the most common tool for measuring outcomes, followed by referral back to medical colleagues for repeat sleep studies. Home sleep testing units were used in some cases, although not very often.

It is important to also note the limitations of this study, which include the response rate and selection bias. The use of keywords OSA and SDB in the title and introduction may have influenced prospective participants willingness to participate in the survey. In addition, a web-based survey methodology may be biased toward younger or more computer literate practitioners. Finally, it is not known if the respondents to this survey reflect a representative subsample of the AAPD membership, and the variety of modalities for palatal expansion were not specifically addressed, creating other potential limitations. Future studies addressing pediatric OSA may expand the current body of knowledge by focusing on CBCT airway volume analysis, interdisciplinary treatment approaches, and providing more detailed surveys of evaluation/treatment protocols.

Conclusions

Based on this study's results, the following conclusions can be made:

1. The majority of pediatric dentists in this study reported no formal instruction, or instruction limited to a lecture format only with respect to OSA and SDB in their residencies.
2. Pediatric dental specialists indicated a strong desire to learn more regarding the diagnosis and management OSA/SDB patients.
3. Routine screening for OSA/SDB among pediatric dentists is common; however, the majority of practitioners do not yet employ these protocols.
4. Pediatric dentists commonly refer patients to physician colleagues for evaluation if OSA/SDB is suspected.
5. The vast majority of pediatric dental specialists do not provide dentistry-based OSA/SDB treatment in their practices.

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