

Status of Sleep Apnea and Snoring Disorder Curriculum in U.S. Advanced Education Prosthodontic Programs

**Running Title:** Sleep Medicine Curriculum in Prosthodontic Programs

**Authors**

Anna Manzotti DDS, MS<sup>1</sup>, Christine Roenitz DMD<sup>2</sup>, Judy Chia-Chun Yuan DDS, MS<sup>3</sup>, Cortino Sukotjo DDS, PhD<sup>4</sup>, Isabella da Silva Vieira Marques DDS, MS<sup>5</sup>, Maria Alfaro DDS<sup>6</sup>, Alvin G Wee DDS, PhD, MPH.<sup>7</sup>

**Institutions**

<sup>1</sup>Private practice, Italy

<sup>2</sup>Clinical Instructor, Department of Growth and Development, College of Dentistry, University of Nebraska Medical Center, Lincoln, NE

<sup>3</sup>Private practice, Brazil

<sup>4</sup>Graduate Prosthodontics Resident, Department of Biological and Material Sciences, Division of Prosthodontics, University of Michigan, Ann Arbor, MI

<sup>5</sup>Associate Professor, Department of Restorative Dentistry, University of Illinois at Chicago College of Dentistry, Chicago, IL

<sup>6</sup>Associate Professor, Department of Restorative Dentistry, University of Illinois at Chicago College of Dentistry, Chicago, IL

This is the author manuscript accepted for publication and has undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the [Version of Record](#). Please cite this article as [doi: 10.1111/jopr.13199](https://doi.org/10.1111/jopr.13199).

This article is protected by copyright. All rights reserved.

<sup>7</sup>Professor and Director, Division of Prosthodontics, Department of Restorative Sciences, University of Minnesota School of Dentistry, Minneapolis, MN

**Corresponding Author:**

Dr. Alvin G. Wee

Professor and Director, Division of Prosthodontics, Department of Restorative Sciences, University of Minnesota School of Dentistry

9-470 Moos Health Science Tower, 515 Delaware Street SE., Minneapolis, MN 55455

wee00008@umn.edu.

ORCID: <https://orcid.org/0000-0002-4428-8443>

**Disclosure Statement**

The authors report no conflicts of interest.

Accepted May 11, 2020

**Abstract**

**Purpose:** To assess the management of sleep apnea and snoring disorders in Advanced Education Programs in Prosthodontics (AEPP) in the United States.

**Materials and Methods:** A 51 item, online survey was sent to program directors at 48 AEPPs in the United States in 2015. Data results were analyzed descriptively.

**Results:** Thirty-five program directors responded to the survey. Twenty-four (68.6%, N=35) programs report not having a dedicated course for the treatment of sleep apnea and snoring disorders. The majority (94.3%) of programs chose to treat sleep disordered breathing with oral appliance therapy and 80.0% (N=35) of programs utilize customized sleep apnea oral devices. However, only 48.6% (N=35) and 51.4% (N=35) of programs regularly address sleep apnea and snoring disorders at initial examination during the comprehensive exam and medical history questionnaire, respectively.

**Conclusions:** The confidence interval for this survey is 8.71 at a confidence level of 95% due to a response rate of 72.9%. This confidence interval suggests there is responder bias in the survey results. Therefore, the results of this survey provide a suggestion of how sleep disorders are managed in AEPPs. Programs appear to be consistent among each other with regards to treatment modalities for sleep disordered breathing. The results suggest that patients are not screened enough to receive treatment addressing sleep disorders.

**KEYWORDS:** Obstructive Sleep Apnea, Snoring Disorder, Sleep Medicine, Curriculum, Prosthodontics, Quality of Life

Obstructive sleep apnea (OSA) is characterized by recurrent episodes of partial or complete upper airway collapse during sleep and it is highlighted by a reduction in, or complete cessation of, airflow despite documented ongoing inspiratory efforts.<sup>1</sup> It is a common disorder, affecting 16% to 37% of the adult population.<sup>2</sup> Only 14% percent of dentists routinely screen every patient for OSA.<sup>3</sup> A common therapy provided to patients with OSA is oral appliance fabrication by their dentist after referral from a sleep physician. Treating patients with sleep apnea involves understanding the symptoms of sleep-disordered breathing, knowing when to refer to a physician certified in sleep medicine, assessing the temporomandibular joint, occlusion, oropharyngeal structures, the patient's orofacial pain, and their headaches.<sup>4,5</sup> The American Academy of Sleep Medicine<sup>4</sup> and the Canadian

Sleep Society<sup>5</sup> recommend additional training and certification for a dentist to treat sleep apnea and snoring disorders.

The instruction of treating OSA in predoctoral dental programs is controversial due to the “legal and safety issues with respect to the rigid guidelines that define the standard level of care.”<sup>6</sup> There are no requirements to teach sleep medicine in the Commission on Dental Accreditation (CODA) standards for predoctoral dental education.<sup>7</sup>

The only advanced dental education programs with CODA requirements in sleep medicine/disorders are programs that teach orofacial pain, oral and maxillofacial surgery, and prosthodontics. The orofacial pain specialty education has the most comprehensive CODA requirements in terms of treating sleep disorders with training in: sleep physiology and dysfunction; cognition and sleep problems; psychologic disorders and their association with sleep disorders/medicine; clinical training in assessment and diagnosis of sleep disorders; managing sleep-related breathing disorder intraoral appliances; pharmacotherapeutic treatment of sleep management; and patient experience with sleep related disorders.<sup>8</sup> The oral and maxillofacial surgery education emphasizes the surgical treatment modalities for treatment of sleep disorders.<sup>9</sup> The current CODA requirement for prosthodontic resident education in sleep disorder is to “receive didactic discipline-specific instruction.”<sup>10</sup> There is no specific clinical education requirement in the treatment of sleep disorders such as OSA in the CODA guidelines.

Prosthodontists have a responsibility to restore and maintain the oral health, function, comfort, and appearance of patients.<sup>10</sup> Prosthodontists frequently treat patients with signs of severe bruxism such as attrition, broken restorations, mobility, and loss of teeth caused by occlusal trauma. Mengatto et al. found that “Sleep bruxism is prevalent in individuals with gastroesophageal reflux disease (GERD).”<sup>11</sup> There is also a strong association between sleep disordered breathing and bruxism,<sup>12, 13, 14</sup> as well as GERD and sleep disordered breathing.<sup>15</sup> In general, both “sleep bruxism and nocturnal GERD are common in patients with OSA.”<sup>16</sup> Prosthodontists who treat patients with

OSA may require training in the diagnosis and management of sleep-related breathing disorders because their patient population often present with signs of bruxism, the effects of acid erosion due to GERD and their concomitance with sleep apnea. Therefore, the objective of this study was to assess the level of competency and treatment of OSA and snoring disorders in AEPPs in the United States.

## **Materials and methods**

This study was approved by the University of Illinois at Chicago, Office of the Protection of Research Subject, Research Protocol #2014-0638. A survey of fifty-one items was sent to the program directors at 48 Advanced Education Prosthodontics programs in 2015 to assess resident education and training of OSA and snoring disorder. Databases of advanced education in prosthodontics program directors were retrieved from the ACP and American Dental Association (ADA) websites. Thirty-five program directors responded to the survey. Questions that not all 35 responders answered were excluded from the study in addition to questions that did not have defined parameters. The online survey emailed to program directors was created based on previous studies<sup>7</sup> with some modification. A reminder email was sent twice, two weeks apart after the initial email was sent, in an effort to increase response rate.

The online survey was created, collected and managed using REDCap electronic data capture tools hosted at University of Illinois at Chicago Center for Clinical and Translational Science.<sup>17,18</sup> Specifically, questions addressed: whether or not there was a specific OSA and snoring disorder course in the program director's AEPP; whether OSA and snoring disorders were included in the comprehensive examination; if they are included in the medical history questionnaire; if referrals are accepted, made and to what specialist patients are referred to; which type of sleep apnea oral devices are used; how many appliances are delivered per year; which therapies for treating sleep disordered breathing are used in the AEPP and whether or not there is a follow up protocol for

patients. Responses were downloaded to a spreadsheet format using Microsoft Excel (Version 16.20). Data were compiled in aggregate and analyzed descriptively.

## Results

Thirty-five program directors of the 48 AEPPs responded to the survey emailed to them. The response rate was 72.9%. Of the 35 responding program directors only 31.4% (N=35) of the respondents have a dedicated course for those topics. About half (48.6%, N=35) of the responded programs did not include sleep apnea and snoring condition in the medical history questionnaire and 51.4% (N=35) did not ask the patients about their sleep quality and snoring during the comprehensive examination in the clinic. The majority (82.8%, N=35) of the programs accept referral for sleep apnea and snoring disorder sometimes or all the time (Fig 1). Twenty-three programs did not refer their patients to other specialists (65.7%, N=35). Programs that do refer their patients mostly refer them to a sleep physician (58.3%, N=12). Other specialists that AEPPs refer to for sleep disorder therapy are shown in Table 1.

Twenty-eight programs (80.0%, N=35) chose to use customized appliances when selecting a sleep apnea oral device. Two (5.7%) programs selected prefabricated oral devices and five (14.3%) program directors noted the question was not applicable. All of the program directors that selected prefabricated oral devices chose the Thornton Adjustable Positioner (TAP) appliance, a mandibular advancement device, to deliver to their patients. Twenty-six programs (74.3%, N=35) delivered less than ten sleep apnea oral devices per year. Five (14.3%) programs delivered no oral appliances, 21 (60%) delivered less than 10, five (14.3%) delivered between 10 and 20, four (11.4%) delivered between 21 and 50, and none delivered more than 50. Oral appliance therapies were the most used therapy (94.3%) to treat sleep disorders (Fig 2). The two program directors that selected "other" in the question discussing therapies for treating sleep disordered breathing used in their post-graduate program specified "other" as: no therapy or not applicable, respectively. Twenty-one programs (60.0%, N=35) have a follow up protocol when treating such patients, six (17.1%) programs have no

follow-up protocol, five (14.3%) sometimes use a follow-up protocol and three (8.6%) programs reported “not-applicable.”

## Discussion

■ The total response rate of 72.9% provides a confidence interval of 8.71 at a confidence level of 95%. In order to obtain a confidence interval of 5 or smaller, the number of responders would have needed to be 43 or greater. Therefore, there is responder bias in this study. Responder bias may imply that participants value sleep disorder management more than those that did not participate. In addition to responder bias, limitations to this study involve question design, representation, survey format, and term definition. The questions and actual survey are not validated questions or validated instruments. Therefore, the results of this study provide only a suggestion of how OSA and sleep disorders are managed in AEPPs.

The results of the survey suggest that sleep apnea and snoring disorder treatment is not emphasized in the curriculum, as indicated by the majority (68.6%, N=35) of responders not having a dedicated course for it. The lack of emphasis of OSA treatment in prosthodontic curriculum is not mirroring the significant effects it has on the ability for a large portion of the U.S. population to function productively.

A future study direction would be to understand the proportion of prosthodontic patients that have sleep disorder compared to the average population. However, this cannot be demonstrated until all prosthodontic patients are screened for sleep disorder at their comprehensive exam. Additionally, evaluating whether or not patients who are found to be at risk for sleep apnea follow through with referral and treatment to a sleep physician after it has been included in comprehensive examination and medical history questionnaires at prosthodontic AEPPs. An evaluation of treatment after standardization of sleep disorder curriculum would be helpful to assess its effectiveness and competence. A survey of prosthodontic program director opinions about

treating sleep apnea and snoring disorders with oral appliances and their opinions of who should primarily be fabricating appliances would provide valuable insight into the future of sleep apnea and snoring disorder treatment by prosthodontists.

Some limitations to incorporating a larger portion of sleep disorder diagnosis and management into the curriculum are that it will compete with the addition of implant surgery and digital dentistry, two topics that seem to have greater enthusiasm by residents and their program directors and will compete with other educational requirements of prosthodontic educational programs. Currently dentists that want to treat patients with sleep disorder require additional education as recommended by the American Academy of Sleep Medicine that is separate from the traditional prosthodontic education. Lastly, not all prosthodontic AEPP program directors or faculty have completed the additional dental sleep disorder management education. Aside from these limitations, there is still an exigency for prosthodontists to understand how to diagnose and manage sleep disorders because it is prevalent in the general population and prosthodontists often treat patients with occlusal trauma that may have resulted from a nocturnal parafunctional habit.

## **Conclusion**

Due to the confidence interval of 8.71, the results of this survey provide preliminary information about how sleep disorders are managed in AEPPs. There needs to be further assessment regarding the management of sleep disorder in the dental field in general. The survey results demonstrated that programs only fabricate 10 or less sleep apnea appliances per year on average and about only half of the programs discuss sleep apnea and snoring disorder during the comprehensive examination. These results suggest patients indicated for OSA appliances are most likely being missed during the screening portion of their comprehensive examination.



## References

1. De Backer W: Obstructive sleep apnea/hypopnea syndrome. *Panminerva Med* 2013;55:191-195
2. Lowe AA: Treating obstructive sleep apnea: the case for oral appliances. *Am. J. Orthod Dentofacial Orthop* 2012;142:434-440
3. Chiang HK, Long A, Carrico CK, et al: The prevalence of general dentists who screen for sleep apnea. *J Dent Sleep Med* 2018;5:55-60
4. American Academy of Dental Sleep Medicine Policy Statement on the Diagnosis and Treatment of OSA: <https://aadsm.org/>. Accessed 5/5/20
5. Gauthier L, Almeida F, Arcache JP, et al. Position paper by Canadian dental sleep medicine professionals on the role of different health care professionals in managing obstructive sleep apnea and snoring with oral appliances. *Can Respir J* 2012;19:307-309
6. Ivanoff CS, Hottel TL, Pancratz. Is there a place for teaching obstructive sleep apnea and snoring in the predoctoral dental curriculum?. *J Dent Educ* 2012;76:1639-1645
7. Commission on Dental Accreditation: Accreditation Standards for Dental Education Programs: <http://www.ada.org/>. Accessed 5/5/20.
8. Commission on Dental Accreditation: Accreditation Standards for Advanced Dental Education Programs in Orofacial Pain: <http://www.ada.org/>. Accessed 5/5/20.
9. Commission on Dental Accreditation: Accreditation Standards for Advanced Dental Education Programs in Oral and Maxillofacial Surgery: <http://www.ada.org/>. Accessed 5/5/20.
10. Commission on Dental Accreditation: Accreditation Standards for Advanced Dental Education Programs in Prosthodontics: <http://www.ada.org/>. Accessed 5/5/20.

11. Mengatto CM, Dalberto Cda S, Scheeren B, et al: Association between sleep bruxism and gastroesophageal reflux disease. *J Prosthet Dent* 2013;110:349-355
12. Oksenberg A, Arons E: Sleep bruxism related to obstructive sleep apnea: the effect of continuous positive airway pressure. *Sleep Med* 2002;3:513-515
13. Phillips BA, Okeson J, Paesani D, et al: Effect of sleep position on sleep apnea and parafunctional activity. *Chest* 1986;90:424-429
14. Sjöholm TT, Lowe AA, Miyamoto K, et al: Sleep bruxism in patients with sleep-disordered breathing. *Arch Oral Biol* 2000;45:889-896
15. Gislason T, Janson C, Vermeire P, et al: Respiratory symptoms and nocturnal gastroesophageal reflux: a population-based study of young adults in three European countries. *Chest* 2002;121:158-163
16. Hesselbacher S, Subramanian S, Rao S, et al: Self-reported sleep bruxism and nocturnal gastroesophageal reflux disease in patients with obstructive sleep apnea: relationship to gender and ethnicity. *Open Respir Med J* 2014;8:34-40
17. PA Harris, R Taylor, R Thielke, et al. Research electronic data capture (REDCap) – A metadata-driven methodology and workflow process for providing translational research informatics support, *J Biomed Inform* 2009;42:377-81
18. PA Harris, R Taylor, BL Minor, et al. REDCap Consortium, The REDCap consortium: Building an international community of software platform partners, *J Biomed Inform Epub* 2019

Table 1. Specialists that AEPPs Refer to for Sleep Disorder Therapy.

Other Specialists that AEPPs Refer to for Sleep Disorder Therapy, select all that apply (N=12) *	Results
Sleep Physician	7 (58.3%)
Orthodontics	2 (16.7%)
Ear, Nose and Throat (ENT) Specialist	2 (16.7%)
Oral and Maxillofacial Surgery	1 (8.3%)
Other: Sleep Dentist	1 (8.3)
Other: Temporomandibular Disorder Specialist	1 (8.3%)
Other: Oral Maxillofacial Prosthodontist	1 (8.3%)
Other: Oral Medicine Specialist	1 (8.3%)
Other: Respiratory Therapist	1 (8.3%)
Nutritionist	0 (0%)

\*N=12 represents the number of program directors, out of 35, who refer patients for sleep disorder therapy.

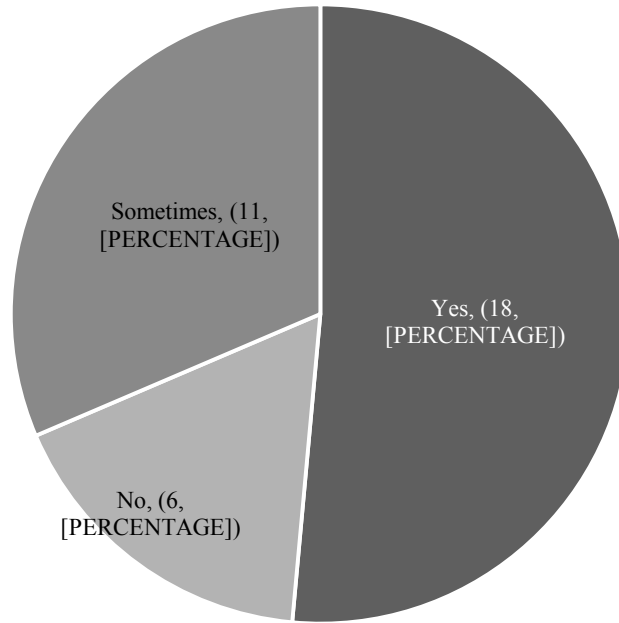


Figure 1. Referral Acceptance for Sleep Apnea and Snoring Disorders in AEPPs (N=35).

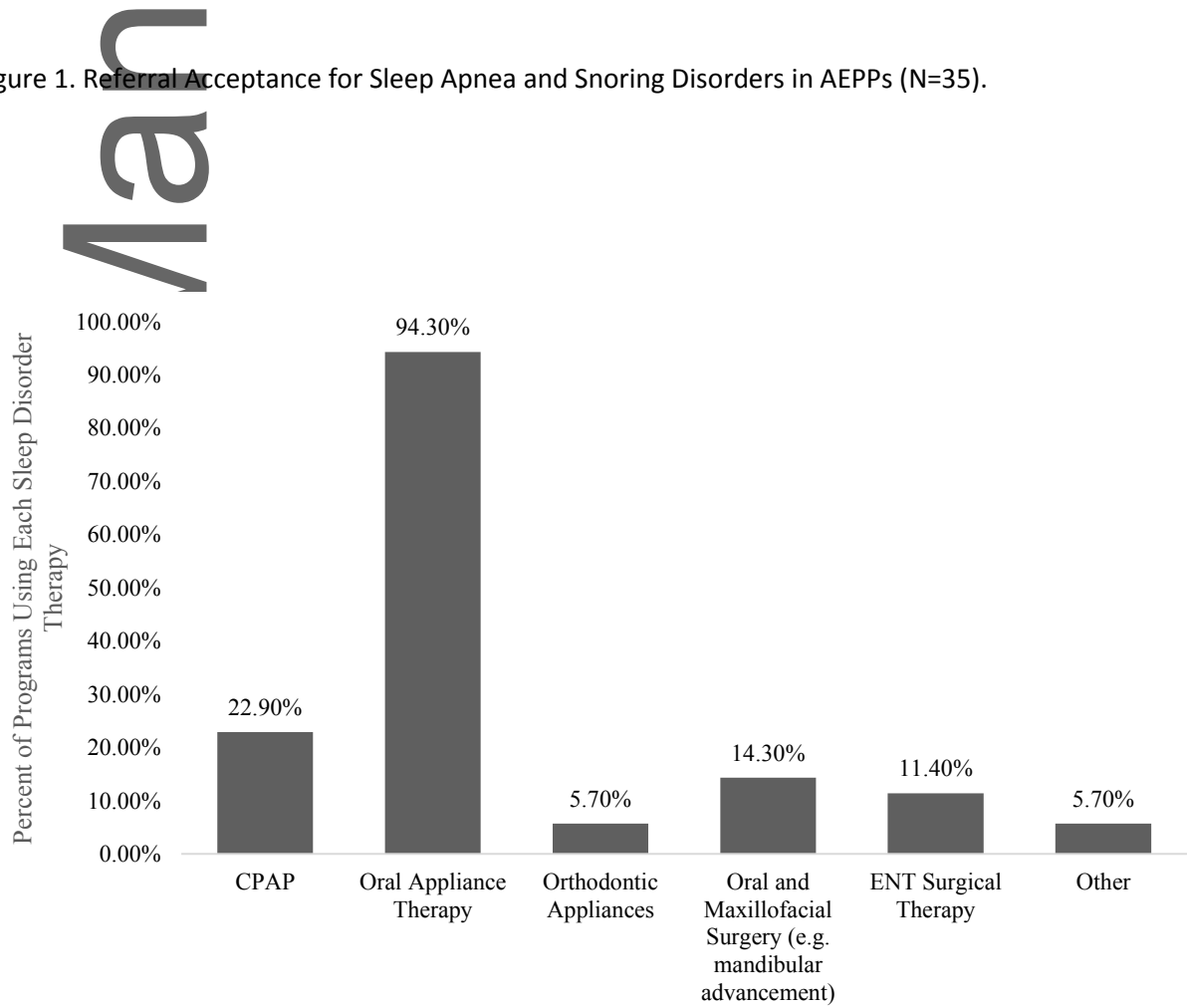


Figure 2. Sleep Disorder Therapies Used in AEPPs