Sleep Medicine Content in Dental Hygiene Education

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Abstract: According to the National Research Council, 70 million Americans chronically suffer from approximately 60 medically recognized sleep disorders. With most clinicians unaware of these disorders, many individuals remain undiagnosed. To effectively address this issue, health care professionals must work collaboratively to educate, identify, and treat patients with sleep disorders. However, medical and dental clinicians do not receive adequate education in sleep medicine. On the frontline regarding prevention and counseling, dental hygienists play an important role in patient education, screening, and management of sleep disorders. The aim of this study was to assess the amount of sleep medicine content in U.S. dental hygiene programs. An electronic survey was emailed to all 334 accredited U.S. dental hygiene programs. The 18-question survey assessed the sleep medicine content presented during the 2012-13 academic year. A total of 35.3% (n=118) of the programs responded. The mean number of hours devoted to sleep medicine in their curricula was 1.55 hours (SD=1.37). Although 69% (n=79) of the responding programs reported spending time on sleep bruxism (mean=1.38 hours, SD=0.85), only 28% (n=32) reported spending time on other topics such as snoring and obstructive sleep apnea (mean=1.39 hours, SD=0.72). These results suggest that sleep medicine is included in the majority of U.S. dental hygiene programs, but the content is limited and focused on sleep bruxism. This level of training is inadequate to prepare dental hygienists for their potential role in patient education, screening, and management of sleep-related breathing disorders.

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Sleep medicine is a recently recognized branch of clinical medicine devoted to the diagnosis and treatment of individuals suffering from chronic sleep disorders.1 The National Research Council has reported that 70 million Americans chronically suffer from approximately 60 medically recognized sleep disorders.2 Many of these disorders go unrecognized and are estimated to create an annual economic burden of hundreds of billions of dollars.

Dental providers are in a position to assist their medical colleagues in the identification of and, if appropriately trained, the management of three sleep disorders that are associated with oral structures. Sleep-related bruxism, primary snoring, and obstructive sleep apnea (OSA) present with intra- and extraoral findings that dentists and dental hygienists should learn to recognize and discuss with patients. This study therefore sought to determine the amount of sleep medicine currently taught in dental hygiene programs across the U.S.

Sleep bruxism (SB) is classified as a Sleep-Related Movement Disorder1 and is diagnosed by reported symptoms of clenching or grinding of the teeth during sleep as well as transient morning jaw muscle tenderness, temporal headaches, and/or jaw locking upon wakening. Although SB does not generally affect sleep architecture, repeated jaw muscle contractions are often associated with sleep arousals.3 SB is naturally of interest to dental providers as it may result in occlusal wear and muscle pain.4 Although no therapy can completely cure SB, acrylic sleep splints that prevent the upper and lower teeth from contacting are used to effectively manage symptoms.4

Primary snoring and OSA are classified as Sleep-Related Breathing Disorders.3 Primary snoring represents the first stage of increased upper airway resistance and is usually noted by the patient’s family member or bed partner.3 Although a social nuisance, it is considered a variant of normal sleep.3 If accompanied by hypertension or daytime sleepiness,
however, the patient should be further evaluated to confirm the absence of OSA. Primary snoring often responds favorably to an oral appliance specifically designed to maintain the mandible in a protruded position while the patient sleeps.6 Dentists with training in the management of these appliances provide and manage the treatment.

OSA is characterized by the complete or partial collapse of the upper airway during sleep. The pharyngeal dilator muscle tone is deceased, resulting in airflow obstruction. The sufferer undergoes a micro- arousal to overcome the obstruction and then proceeds to fall back into deeper sleep, repeating the cycle up to hundreds of times a night.7 Approximately one in five American adults experience mild OSA, and one in 15 have moderate or severe sleep apnea.8 OSA may be life-threatening and is associated with many other health problems such as hypertension,9,10 congestive heart failure,11 Type II diabetes,12 periodontitis,13,14 coronary heart disease,15 depression,16 and a shorter life span.17 Common intraoral findings of sleep-disordered breathing (SDB) are large tongue with scalloped borders and tooth wear.18

Continuous positive airway pressure (CPAP) is considered the gold standard of treatment for OSA, but oral appliance therapy (OAT) can be equally effective6,19-21 and is gaining traction as a viable alternative first line of therapy for mild to moderate OSA.6 As in the management of primary snoring, OAT includes the fabrication, delivery, and management of an oral appliance that stabilizes the mandible in a forward position during sleep to increase the posterior airspace. It must be prescribed by a physician and provided and managed by a dentist with expertise in the field of sleep medicine.6 Contraindications to OAT include periodontal disease, temporomandibular disorders (TMDs), and insufficient number of teeth.

Dental hygienists are on the frontline in dental practices with respect to health assessment and counseling. They routinely take pulse and blood pressure, review medications and medical histories, perform patient oral cancer screenings, discuss tobacco cessation, provide nutritional counseling, and conduct extraoral examinations. With additional education in sleep-disordered breathing, dental hygienists could have a significant impact on the widespread and underdiagnosed condition of obstructive sleep apnea. Dental hygiene programs already include education in areas that overlap with sleep bruxism, snoring, and OSA, but the fragmented and limited manner of this teaching precludes gaining a broader understanding of the medical context in which these “dental” topics fit. A limited number of studies of dental22-24 and medical curricula25 suggest that education in sleep disorders is inadequate to prepare clinicians to effectively identify, refer, and/or manage affected patients. In an assessment of dental school curricula, Simmons and Pullinger found an average of only 2.96 hours dedicated to sleep medicine with 24.5% of responding schools reporting no curriculum time.22

Health care professionals need to work together to identify, educate, and treat patients with sleep-disordered breathing. Knowledgeable professionals from every health care discipline would greatly increase awareness and lead to more referrals to sleep physicians. Disease severity and potential patient reluctance to adhere to recommended treatment options necessitate collaboration among multiple health care providers, including sleep physicians and dental professionals, to identify the optimum treatment modality for each patient. To date, there are no reported studies of the extent of sleep medicine education in U.S. dental hygiene programs. In order to identify gaps in dental hygiene curricula and to form a basis for recommendations, the aim of this study was to assess the amount of sleep medicine content dental hygiene students receive during their formal education.

Materials and Methods

This study received exemption from the Institutional Review Board at the University of North Carolina at Chapel Hill. For the study, we developed an 18-question survey in fall 2012 to assess the amount of sleep medicine content included in dental hygiene programs’ curricula. The survey was adapted from the questionnaire created and used by Simmons and Pullinger to evaluate dental sleep medicine teaching in predoctoral dental curricula.22 The survey instrument was divided into five sections with questions addressing the following topics: 1) sleep medicine in the didactic curriculum (five questions); 2) sleep medicine in the laboratory/clinical instruction (three questions); 3) other sleep medicine topics (three questions); 4) respondents’ opinions about sleep medicine (three questions); and 5) program demographics (four questions). (The survey is available from the corresponding author.) Some questions limited the respondent to the best answer, while others provided options of “choose all that apply,” “none of the above,” or “other” with space to offer open-ended responses. Respondents
were asked to answer the questions according to their 2012-13 curricula.

A pilot survey was emailed to seven dental hygiene faculty members in North Carolina, Oregon, the District of Columbia, Iowa, and Maine to test for format, content, readability, and time for completion. Based on faculty feedback and review of the pilot study data, we revised the questionnaire for clarity and content. A cover letter and final version of the survey were emailed via Qualtrics to directors of all 334 accredited U.S. dental hygiene programs. Email addresses were obtained from the American Dental Hygienists’ Association (ADHA) website. The first mailing occurred in April 2013. Emails to nonrespondents were automatically generated by Qualtrics in May and again in June 2013. Following the sending of three unanswered emails, confidentiality was broken by the PI only, and individual follow-up phone calls were made to the remaining schools using phone numbers obtained from the ADHA website.

Results were tabulated from the Qualtrics output. Survey responses were reported as descriptive statistics with means and standard deviations. Response frequencies, means, and standard deviations (SDs) were based on the number of programs responding to each question. Geographical region and institutional setting were the primary explanatory variables. Geographic region was defined using the state assignments of the U.S. Census Bureau. Institutional setting was categorized as non-university-based, university without a dental school, and university with a dental school. Fisher’s exact test was used to assess whether the responses to each question were related to geographic or institutional setting. To assess potential bias in responding, a Fisher’s exact test was utilized to determine if the distribution of responding programs differed by geographic region or institutional setting from the nonresponding programs.

**Results**

A total of 118 out of 334 programs responded to the survey, for a response rate of 35.3%. The total number of programs and the number responding were primarily in the South; the smallest number of programs was in the Northeast. No difference was found in the response rate by geographic region \(p=0.92\) (Table 1). Most of the respondents were from non-university-based programs (65% of all programs), followed by programs in colleges or universities without a dental school (20%) and finally by colleges or universities with a dental school (15%). The response rate differed significantly by institutional setting \(p=0.0001\). A higher proportion of programs located at colleges or universities with a dental school (74%) and a lower proportion of non-university-based programs responded to the survey (31%).

**Didactic Curriculum**

The mean number of hours devoted to sleep medicine among all respondents was 1.55 (SD=1.37; \(n=114\)). However, among programs that reported a total time of at least one hour (\(n=92\)), the mean number of hours was 1.92 (SD=1.27).

**Sleep bruxism.** Over two-thirds (69%, \(n=79\)) of the responding programs reported that SB was taught in their dental hygiene curricula (Figure 1). The mean time devoted to SB in the didactic curriculum was 1.03 hours (SD=0.95). Among the respondents, 18% provided two or more lecture hours on SB, while 26% reported that no time was devoted to SB. Figure 2 shows the distribution of hours spent teaching SB for the responding programs. The distribution of hours did not differ by geographic region \(p=0.06\) or by institutional setting \(p=0.84\).

**Topics in sleep medicine exclusive of SB.** The survey found that, of other sleep medicine topics presented in the responding dental hygiene programs, OSA was taught in 32% \(n=36\) and snoring was included in 25% \(n=28\). Curriculum time spent on other topics was not related to geographic region \(p=0.23\), but it did differ significantly among institutional settings \(p=0.03\). The average time devoted to all other topics in sleep medicine in the didactic curriculum, excluding SB, was 0.54 hours.

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**Table 1. Number of responding programs versus total number of U.S. dental hygiene programs, by institutional setting and region**

<table>
<thead>
<tr>
<th>Institutional Setting/Region</th>
<th>Respondents</th>
<th>Total Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-college/university setting</td>
<td>74</td>
<td>244</td>
</tr>
<tr>
<td>College/university without a dental school</td>
<td>27</td>
<td>67</td>
</tr>
<tr>
<td>College/university with a dental school</td>
<td>17</td>
<td>23</td>
</tr>
<tr>
<td>South</td>
<td>43</td>
<td>125</td>
</tr>
<tr>
<td>Midwest</td>
<td>28</td>
<td>84</td>
</tr>
<tr>
<td>West</td>
<td>24</td>
<td>79</td>
</tr>
<tr>
<td>Northeast</td>
<td>15</td>
<td>46</td>
</tr>
</tbody>
</table>

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tion in this area was given to the oral and dental consequences of untreated sleep-related breathing disorders (46%, n=49). Of these programs, 34% (n=36) reported teaching their students about the medical consequences of untreated sleep-disordered breathing, but only 18% (n=19) described the risk factors for OSA and only 5% (n=5) discussed the use of screening questionnaires to detect patients who are at increased risk for sleep-disordered breathing.

**Oral appliances.** Figure 3 summarizes what was reported being taught in dental hygiene programs with respect to oral appliances. Indications or con-

![Figure 1. Sleep medicine topics taught in dental hygiene curricula, by percentage of responding programs](image)

![Figure 2. Time devoted to sleep medicine topics in dental hygiene curricula, by percentage of responding programs](image)
Clinical and Laboratory Instruction

The programs also provided information regarding clinical training in sleep medicine (Figure 4). The majority of the responding programs taught their students to inquire about/discuss tooth attrition (82%, n=90) and SB (67%, n=74). Snoring was discussed with patients during student clinics in 22% (n=24) of these programs followed by OSA (21%, n=23). Excessive daytime sleepiness and insomnia were indications for an oral appliance to treat SB were taught by 62% (n=70) of responding programs. This is in contrast to only 35% (n=37) that described the use of oral appliances to manage snoring or OSA. It is worth noting that 17% (n=19) of the responding programs did not discuss any aspect of oral appliances for SB, while 54% (n=56) did not include any teaching of oral appliances to manage snoring or OSA.

Figure 3. Topics regarding sleep-related oral appliances taught in dental hygiene curricula, by percentage of responding programs

Figure 4. Topics dental hygiene students inquire about/discuss with their patients in dental hygiene curricula, by percentage of responding programs
they were interested in learning more about sleep medicine.

The majority of responding schools (74%, n=81) did not include any time teaching students how to make oral appliances for SB in the laboratory. Of those programs (26%, n=29) that devoted one or more hours to making SB appliances, the students fabricated either one or two appliances for SB in the form of occlusal guards.

Teaching of and Interest in Sleep Medicine

Topics in sleep medicine were most frequently taught in the responding programs in dental materials (41%, n=45) and periodontology (37%, n=41) (Figure 5), but it was not always clear in which year this material was presented. In the responding programs, sleep medicine topics were taught by a dental hygiene faculty member with a master’s degree in 49% (n=54) of programs, by a dental hygiene faculty member with a bachelor’s degree in 18% (n=20), and by a dentist in 37% (n=41).

Among the respondents, 71% (n=77) agreed that sleep medicine content should be incorporated into the dental hygiene curriculum, and 93% (n=100) believed that sleep medicine is an important issue in health care. The majority of respondents agreed that dental hygienists should have a role in identifying or assessing patients who have SB (85%, n=92) and OSA (69%, n=75); and 85% (n=93) indicated that they were interested in learning more about sleep medicine.

Discussion

The goal of this study was to assess the extent of sleep medicine in dental hygiene education and to examine the influence of institutional setting or geographic region. Overall, the survey found that the responding U.S. dental hygiene programs included little, if any, education on sleep medicine. The mean number of total hours devoted to sleep medicine approximated only two hours among those programs that included any aspect of sleep medicine in their curricula. Geographic region and institutional setting had little or no effect on how much sleep medicine was taught in these programs.

Didactic, Clinical, and Laboratory Settings

Among the responding dental hygiene programs, the most commonly reported sleep medicine topic was sleep bruxism. However, it was included mainly in the didactic setting, with little instruction in the clinical and laboratory settings. There was no statistically significant difference among institutional settings in the amount of SB taught. In only a few programs were dental hygienists taught to fabricate and deliver occlusal guards for SB, and fewer than half taught
how appliances affect SB. This finding is similar to the Simmons and Pullinger study that reported only 8.1% of dental schools included a hands-on clinical laboratory experience with SB. In our study, students in the majority of responding dental hygiene programs were taught to discuss SB with their patients in clinic; however, the level of detail is unknown. Considering the little time devoted to SB, one can conclude that dental hygiene students are limited in their ability and confidence to discuss the disorder and the oral appliance used to treat the condition.

The amount of education about other topics in sleep medicine was minimal. Almost two-thirds of the responding programs did not include snoring or OSA in their curricula. The medical relevance of sleep-related breathing disorders seems to be taught in more than twice the percentage of dental schools (86.5%) than we found in dental hygiene programs (32%). This difference suggests that most dental students graduate with some knowledge of OSA, while the majority of dental hygiene students graduate with very little understanding at all. Moreover, our findings demonstrate that topics about oral appliances for OSA were seldom included in dental hygiene curricula. Simmons and Pullinger’s study found that 86.5% of the dental schools taught students about OAT for sleep-disordered breathing, 75.7% discussed CPAP, and 83.8% reviewed diagnoses for OSA. In contrast, our study found that the dental hygiene programs discussed oral appliances to treat SB, but little was presented regarding OSA and OAT.

Our results also revealed that topics in sleep medicine are not consistently taught in a particular year or specific course in dental hygiene programs. It is possible that some programs teach sleep medicine in the first and second years and in multiple courses. When asked “In which course is sleep medicine taught?,” a relatively high number of the respondents selected “other,” demonstrating uncertainty in course identification. The fragmented nature of teaching sleep medicine suggests the need for a defined strategy for implementation of education in sleep medicine.

Limitations of the Study

The sample in our study was representative of dental hygiene programs regionally but not by institutional setting, and thus our findings cannot be generalized to represent all U.S. dental hygiene programs. The survey had a higher response rate from programs in university settings, particularly from those universities with a dental school, than from programs in non-university settings. It is possible that faculty members at a college or university are more likely to be involved in their own research and more willing to participate in other studies. It is also possible that programs without a university affiliation were more likely to exclude sleep medicine content in their curricula and thus were less interested or motivated to participate in the survey. Perhaps programs that are not part of a multidisciplinary environment are less likely to be exposed to connections between topics, including those related to sleep disorders.

Another possible limitation of our study was a low response rate of 35%, although this is not significantly lower than the response rates to other recent surveys of dental hygiene program directors. An online survey of dental hygiene programs by Dehajtem et al. reported a 56.9% response rate. A study by Navickis et al. received a 48% response rate from their online survey sent to U.S. dental hygiene program directors. A third web-based survey sent to dental hygiene programs achieved a 46% response rate. The topics surveyed in those studies were patients with special needs, clinical assessment practices, and eating disorders, respectively. The trend for low response rates might be attributed to an increasing number of surveys received by dental hygiene program directors and other faculty members. Although a valuable assessment tool, overuse of surveys in research may cause them to be overlooked.

It is also possible that the faculty members in our study were unsure how to answer the questions since the topic is relatively unfamiliar. The study of dental schools by Simmons and Pullinger received a much higher response rate of 87.5%, but those investigators reported an aggressive follow-up of non-respondents that included multiple personal phone calls. The survey in our study, with 18 questions, was also longer than the Simmons and Pullinger survey, which comprised eight questions. The length and unfamiliar topic of our survey may have been a discouraging combination for many program directors. The low response rate is likely reflective of many factors, including lack of time to complete the survey and the limited sleep education instruction to describe.

Sleep Medicine and Dental Hygiene Practice

The Commission on Dental Accreditation (CODA) standards for dental hygiene programs state
that “dental hygiene science content must include health promotion, and graduates must be competent in providing the dental hygiene process of care which includes comprehensive collection of patient data to identify the physical and oral health care status.” Dental hygienists spend the majority of their time combating periodontitis with scaling, prophylaxis appointments, and oral hygiene instruction. Considering recent research that suggests OSA may be a predictor of periodontitis, it would behoove dental hygienists to have a better understanding of OSA in order to adequately treat and educate their patients about periodontal disease. Appropriately educated dental hygienists could have an effect on the patients’ outcomes of treatment since uncontrolled periodontitis is a contraindication to OAT.

It is also important to note that the number of dental hygiene graduates has increased by 73.4% from 1986 to 2010, and there were 7,000 graduates in 2010. Incorporation of sleep medicine into dental hygiene curricula could result in 7,000 more health care providers a year who are knowledgeable about sleep disorders. This may increase the number of individuals who are diagnosed with OSA as well as improve the management and prognosis of those who are affected by the condition.

With the rising prevalence of sleep-related breathing disorders and the use of oral appliances in their management, dental hygienists have an opportunity to impact the care of patients with these widespread disorders. Dental hygiene curricula should provide enough education about these disorders to enable future dental hygienists to screen and knowledgeably discuss risk factors and symptoms with their affected patients and to communicate effectively with other health professionals.

**Recommendations**

The finding in our study that 57% of responding dental hygiene programs include the association between OSA and periodontal disease in their curricula was especially surprising since the data that report this association are fairly new. Perhaps this indicates that findings directly related to dental hygiene are more likely to be added to curricula. Therefore, acknowledging the potential role of dental hygienists in screening for sleep-related breathing disorders is the first step in curriculum additions. As a result of their study, Simmons and Pullinger made recommendations for dental school curricula that are equally appropriate for dental hygiene program content. Their recommendations included competencies to assess students’ ability to recognize and screen patients with comorbidities, discussion of medical consequences of untreated sleep disorders, description of available treatment options, and comorbidities of snoring.

Dental hygiene didactic curricula should include the definition and prevalence of OSA, its clinical presentation, risk factors and consequences of untreated sleep-disordered breathing, and treatment options such as occlusal guards, CPAP, and OAT for sleep-related breathing disorders. Clinical curricula should include questions relating to sleep-disordered breathing in the medical history. Students’ clinical competencies could include recognizing patients with comorbidities, screening patients for OSA, recognizing common intraoral findings, discussing sleep-disordered breathing with patients, and recommending a visit to their physician.

There are several ways to include sleep medicine in dental hygiene curricula. One is to require that certain topics be incorporated into existing courses of the first year, such as human anatomy or nutrition. Doing so would make room to focus more on practical subjects relevant to dental hygiene and allow for more flexibility in general within the program. Another option would be to implement a short online course in sleep medicine, with posted lectures and online assessments. An online alcohol intervention course piloted to dental students was found to significantly change their knowledge, attitudes, and behaviors, demonstrating such a methodology is feasible for consideration. A third option would be to involve other health professions in education regarding sleep disorders, thus encouraging inter- and intraprofessionalism. An interdisciplinary sleep medicine course could potentially include dental hygiene students, dental students, nursing students, and or medical students and thus foster future professional relationships.

**Conclusion**

This study found that the responding U.S. dental hygiene programs included little education in sleep medicine, with sleep bruxism being the main topic taught. Very little is taught regarding obstructive sleep apnea and oral appliances for sleep-related breathing disorders. However, dental hygienists have the potential to increase awareness and aid in the management of oral appliance therapy. The dental hygiene profession is expanding and changing with
technology, social trends, epidemics, and research. The curriculum should reflect and adapt to new information to successfully prepare future dental hygienists to become highly qualified health care providers. The fact that most dental hygiene curricula in our study include some education in sleep disorders indicates that programs are aware of the relevance of dental hygiene in addressing this topic. However, more attention needs to be given to sleep disorders in dental hygiene curricula to prepare future practitioners to assist their patients with treatment options.

REFERENCES