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Assessment of Tobacco Dependence Curricula in U.S. Dental Hygiene Programs

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Abstract: Tobacco dependence education (TDE) continues to be a vital component of dental hygiene curricula—made even more important by the fact that tobacco cessation in adults in the United States has stagnated over the past ten years. This study was undertaken to assess the salient characteristics of TDE in U.S. dental hygiene programs. A fifty-one question survey was mailed to the program directors of all 283 accredited dental hygiene programs during the 2007–08 school year (this number does not include the programs in Illinois, which were excluded since they had participated in a previous study). A total of 187 schools returned the survey for a return rate of 66 percent. Curricular content, minutes spent on each topic, existing level of clinical competence measured, expected level of clinical competence, and resources used were assessed. Respondents reported an average of 6.7 hours spent on all identified components of tobacco education. While 77 percent of respondents reported formally assessing whether a student asked if a patient used tobacco, only 26 percent indicated having a formal competency utilizing all of the U.S. Public Health Service's Clinical Practice Guideline 5 As and 5 Rs. In contrast, 72 percent of program directors reported expecting their graduates to be competent in a moderate intervention that included all 5 As. Though there is a clear commitment to TDE among dental hygiene programs in the United States, we recommend training to a more intensive level of TDE in order to facilitate broader adoption of comprehensive, evidence-based guidelines.

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Smoking continues to be the number one preventable cause of death in the United States, with approximately forty-three million or 20.6 percent of adults identifying themselves as current smokers.¹ In addition, approximately 3 percent of adults and 8 percent of high school students say they use smokeless tobacco.^{2,3}

The literature continues to demonstrate the numerous harmful effects of tobacco on the oral cavity and on outcomes of dental procedures. Johnson and Guthmiller conducted an extensive review of the literature and concluded that cigarette smoking is a “well established risk factor for periodontitis.”⁴ Vered et al. found “a constant association between smoking and periodontal status” in a study of young adults eighteen to twenty-one years of age, noting that the more the young adults smoked, the more likely they were to suffer from periodontal disease.⁵ Patients who smoke have a significantly enhanced risk for implant failure,⁶ smoking has a negative effect on root-coverage procedures,⁷ and there is a twofold higher risk of tooth loss in smokers than nonsmok-

ers.⁸ In addition, tobacco smoke not only affects the health of the smoker, but that of nonsmokers and children who breathe the toxic fumes. Even when other variables are controlled for, the incidence of dental caries in children exposed to environmental tobacco smoke may be higher than in children whose parents do not smoke.^{9,10}

The need for tobacco dependence education (TDE) to continue to evolve and become an integrated component in dental and dental hygiene curricula remains a high priority. Dentists and dental hygienists have many opportunities throughout their careers to provide interventions that could prevent or lessen tobacco-related morbidity or mortality. Studies examining the state of TDE in the dental professions over the past twenty years have informed educators and guided them to enhance current educational practices and make suggestions for improvement.¹¹⁻¹⁵ During this time, important policy changes have occurred, such as indoor smoking bans, a steep increase in cigarette taxes, and the availability of state tobacco quitlines. In addition, health care providers

and educators have had access to numerous, high-quality tobacco cessation resources, including the U.S. Public Health Service's Treating Tobacco Use and Dependence: Clinical Practice Guideline, which first appeared in 2000 and was expanded in 2008.¹⁶ Unfortunately, even with these positive changes, smoking by U.S. adults has shown a slight increase in 2008 and remains an important general and oral health concern.¹⁷

The purpose of this study was to assess the current level of tobacco dependence education being taught in dental hygiene programs in the United States. The results of this study will inform the ongoing dialogue in health professions education concerning the level of competence required of students in providing tobacco education.

Methods

A cross-sectional survey design was used. The American Dental Hygienists' Association (ADHA) website was used to identify the current accredited associate and baccalaureate dental hygiene education programs in the United States. All of the accredited dental hygiene programs were included in the study, with the exception of those in Illinois. The twelve Illinois programs recently participated in a three-year tobacco curriculum study sponsored by the American Cancer Society, Illinois Division^{15,18} and were thus excluded from this study.

A total of 283 dental hygiene programs were included in the initial mailing during the 2007–08 academic year. Program directors were mailed a packet containing a cover letter, a fifty-one-question survey, a tobacco educational CD as an incentive to respond, and a self-addressed, stamped envelope. Program directors were asked to answer the survey or delegate the task to a faculty member familiar with tobacco education offered in their program. Those schools that did not respond in two weeks were mailed a follow-up postcard encouraging participation. Finally, schools that had not responded in six weeks were resent a complete initial mailing. The research protocol was reviewed and approved by the Southern Illinois University Human Subject Review Committee. The data were entered into a database using anonymous school codes and analyzed using SPSS v. 16.

The survey instrument was adapted from the tobacco dependence education survey developed by

Stockdale et al. for the American Cancer Society tobacco education assessment of the twelve associate dental hygiene programs in Illinois conducted from 2003 to 2006.¹⁸ This study generated several surveys to assess existing tobacco education activities and faculty self-efficacy in providing tobacco education and to evaluate a newly developed tobacco cessation curriculum. Earlier national tobacco education surveys^{11,13,19-23} were also reviewed for consistency of questions and comparison purposes. Permission to use the Stockdale et al. survey¹⁸ and specific items from the Barker and Williams study¹³ was requested and obtained.

Finally, a newly developed Levels of Care model^{24,25} was adapted to assess the level of tobacco cessation intervention that program directors felt dental hygiene students should be able to demonstrate prior to graduation. The Levels of Care model expands the current PHS guideline model consisting of Brief and Intensive levels to a three-level intervention of Brief, Moderate, and Intensive levels. The Brief Intervention was defined as a one- to three-minute interaction that includes Ask, Advise, and Refer to identify the patient as a tobacco user, connect the patient's oral health condition to his or her tobacco use, and refer the patient for further assistance. A Brief Intervention, when compared to no advice, significantly increases the odds that a person will achieve abstinence, with approximately 3 percent doing so.²⁶ The Moderate Intervention was defined as a five- to fifteen-minute interaction that includes the 5 As (Ask, Advise, Assess, Assist, Arrange), using brief motivational interviewing, discussion of cessation medications, and the 5 Rs (Relevance, Risks, Rewards, Roadblocks, Repetition), including the benefits of quitting. The Intensive Intervention was defined as at least a twenty-minute intervention that may need multiple sessions, the 5 As, the 5 Rs, motivational interviewing, development of a detailed quit plan, exploration of past failures, a review of cessation medications, and the adjustment of recommendations as needed. In a recent study, up to 52 percent of those who received this level of intervention, combined with the use of medications, have achieved long-term abstinence.²⁷ Summarizing the different levels of counseling intensity, the PHS guideline states: "there was a clear trend for abstinence rates to increase across these session lengths, with higher intensity counseling producing the highest rates [of abstinence]" (p. 84).¹⁶

Results

Of the 283 surveys mailed, 187 completed surveys were returned, for a response rate of 66 percent. The majority (104) of respondents were program directors (57 percent of those answering the questions). The characteristics of the responding programs were similar to the overall characteristics of dental hygiene schools in the United States: 22 percent were baccalaureate programs and 78 percent associate programs; 11 percent were affiliated with a dental school. Programs reported a mean number of full-time faculty members of four (SD=2) and part-time faculty members of seven (SD=6), with six (SD=6) devoted to clinic or lab only.

Although programs reported a variety of protocols for tobacco cessation in their clinics, the majority (68 percent) agreed that they focus on identifying tobacco users and referring them to an outside tobacco cessation counseling resource such as a quitline. This protocol follows the American Dental Hygienists' Association (ADHA)'s Ask, Advise, Refer initiative.²⁸ A minority (14 percent) of programs had dentists available to prescribe tobacco cessation medications. Only a few programs (11 percent) reported a dedicated tobacco cessation clinic where patients received intensive counseling. A minority of the programs (35 percent) indicated that one primary faculty member or tobacco champion provided most or all of the tobacco-related education and training. About half of the tobacco champions were responsible for all TDE in their programs.

The next group of questions asked how tobacco-related material was presented in dental hygiene programs. A strong majority of programs (85 percent) reported offering TDE in several courses, including lecture and clinical settings. However, when probed further, 87 percent indicated that they offered their tobacco-related materials in a clinic seminar or clinic only. About half (56 percent) offered some or all of their tobacco-related material in a case study format.

Content and Time Spent

Table 1 summarizes the tobacco dependence topics covered in dental hygiene curricula, along with the time devoted to each. Not shown in the table are the summary statistics: the mean total time spent was 6.7 hours (SD 3.2). The middle 50 percent of the programs reported between 4.2 and 8.8 hours (interquartile range).

The subjects of general and oral diseases related to tobacco were covered most frequently (by 95 percent of reporting programs), and reflected 29 percent of the total time devoted to all identified TDE topics. Tobacco cessation strategies were included by almost as many programs and were given a little less time. Least often covered were the implementation of a clinical tobacco program and community-based tobacco-control interventions, provided by closer to half of the programs and for only ten to twenty minutes.

Educators reported using a variety of resources to build or enhance curricular content. For tobacco cessation, dental hygiene programs most often used

Table 1. Frequency with which a tobacco-cessation content area is covered in U.S. dental hygiene programs, in order of frequency, and mean minutes spent on each area (N=187)

Content Area	Percentage Including Area in Curriculum	Mean Minutes Spent on Area (Standard Deviation)
Oral diseases related to tobacco use	95%	54 (18)
General diseases related to tobacco use	95%	47 (20)
Tobacco cessation strategies	93%	40 (20)
Nicotine dependence	90%	31 (21)
Tobacco prevention strategies	86%	31 (21)
Historical, social, and economic factors associated with tobacco use and the tobacco industry	86%	34 (24)
FDA-approved pharmacotherapies to assist cessation	86%	26 (19)
U.S. Public Health Service's 5As and 5Rs	82%	33 (23)
Stages of change	74%	28 (24)
Brief motivational interviewing	72%	21 (21)
Dental hygiene students' own use of tobacco	71%	20 (21)
How to develop a comprehensive tobacco intervention program in a clinical setting	57%	17 (21)
Strategies for becoming involved in community-based tobacco control	45%	12 (19)

textbooks (73 percent), followed by the ADHA's Ask, Advise, Refer initiative (70 percent),²⁸ as resources. About half of the respondents mentioned each of these categories: websites, professional journals, private organizations (e.g., American Cancer Society), and government agencies (e.g., National Institutes of Health, Centers for Disease Control and Prevention). The two nationally available standardized TDE curricula, *Tobacco Free! Curriculum*²⁹ and *Rx for Change*,³⁰ were referenced by 22 percent and 5 percent respectively.

Assessment of Competence

Participants were asked to which level of competence faculty members formally or informally assess various activities in their clinics. Figure 1 presents the competencies that were formally assessed

(using a form), competencies that were informally assessed (observation or verbal feedback), or competencies that the programs did not assess. The most commonly reported formal assessment was whether the student noted that the patient used tobacco (77 percent), followed by whether the student linked head and neck findings to tobacco use (63 percent). No other tobacco-related competencies were formally assessed by more than half of the programs. Providing resources and follow-up were informally assessed by 53 percent of programs and not assessed by 19 percent. There was no statistical significance found when the percent of time spent and level of clinical competence provided were calculated.

The survey asked participants to indicate the level of competence that dental hygiene graduates should be able to demonstrate by completion of their formal education. Respondents indicated that, in

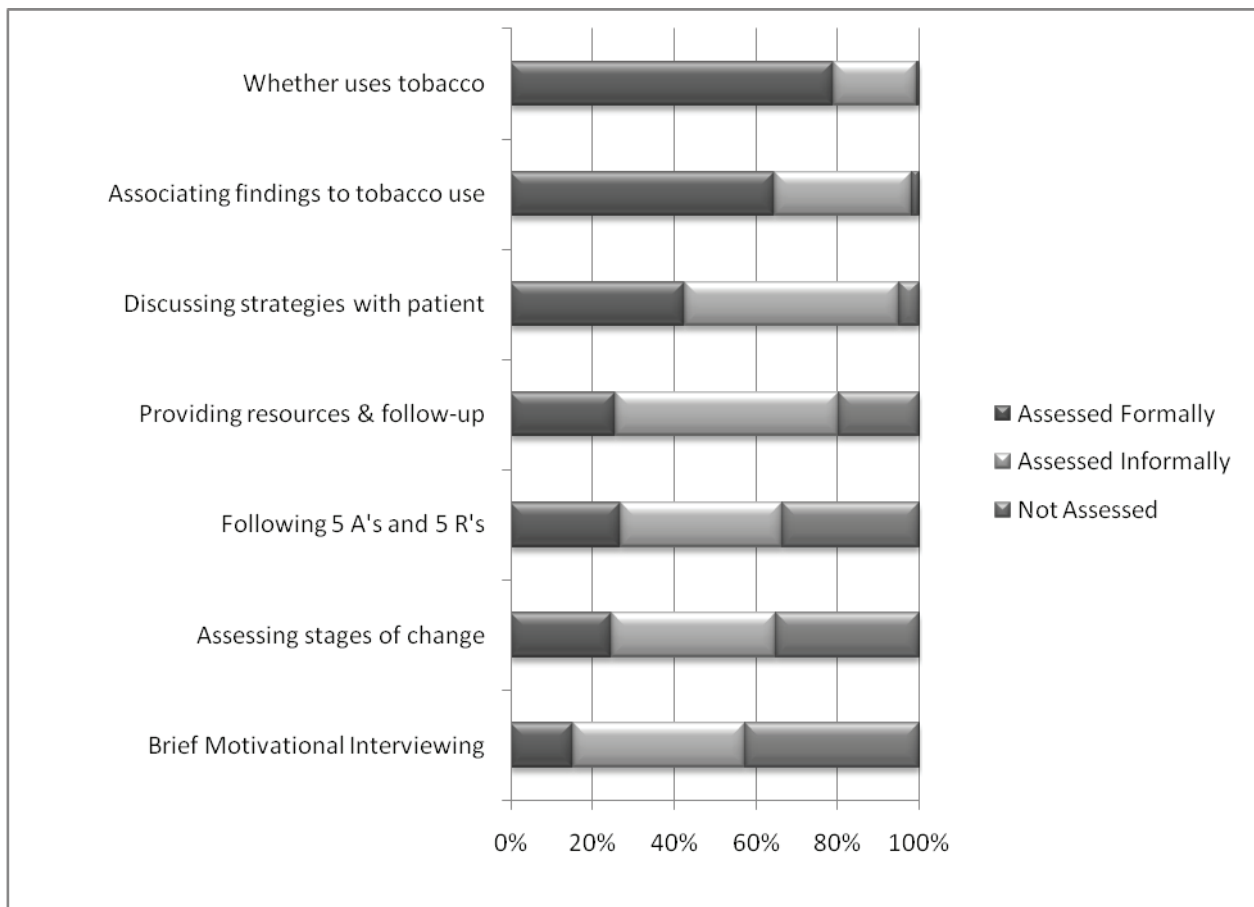


Figure 1. Percentage of U.S. dental hygiene education programs assessing clinical competence (technique evaluation) on various tobacco-cessation counseling activities: formally (with a form), informally, or not assessed

their opinion, dental hygiene students should be able to demonstrate tobacco cessation competence at a Moderate Intervention or higher level (89 percent) by the completion of their formal education (Figure 2).

Discussion

Oral health care providers have a professional and ethical obligation to seek training in and provide evidence-based tobacco interventions for both cessation and prevention. However, research continues to report that limited and inconsistent levels of tobacco interventions are currently being provided in clinical practice.³¹⁻³⁴ This study sought to assess the status of tobacco dependence education currently offered in dental hygiene programs in the United States. The high response rate and the similarity of the respondents' characteristics to national hygiene programs indicate the results are likely to be a valid reflection of current dental hygiene education practices. The results indicate that, in dental hygiene, students are

also being trained to limited and inconsistent levels of clinical practice.

Dental hygiene educators reported a high number of hours spent on TDE: 6.7 hours compared to 2.5 reported by physician assistant program directors²¹ and one to three hours reported in nursing education.¹⁹ In spite of the generous overall time spent on TDE, the data reveal important gaps in dental hygiene curricula. Training on medications for tobacco cessation is considered an essential piece of helping addicted persons quit¹⁶ but received an average of less than twenty minutes in curricula. Other important but complex topics—motivational interviewing and creating a tobacco cessation program in the private dental office—received less than twenty minutes each. Surprisingly for dental hygiene, even involvement in community-based tobacco prevention plans received only a few minutes in a minority of programs. Dental hygiene educators may want to consider shifting some of the tobacco education time spent away from oral pathology to a broader range of tobacco cessation and prevention topics.

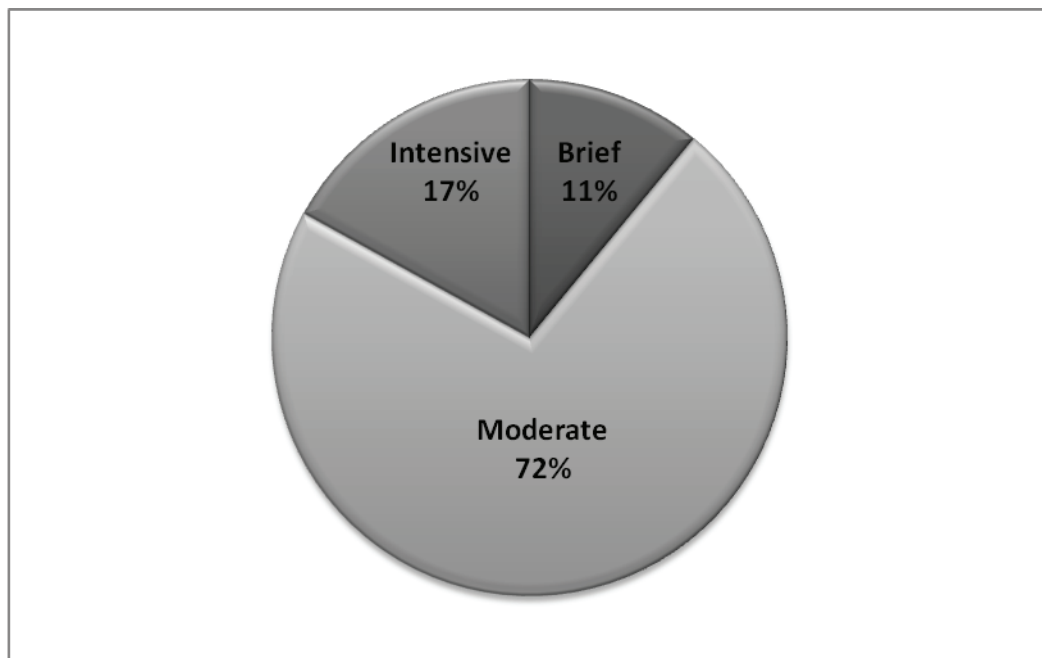


Figure 2. Level of clinical competence that U.S. dental hygiene program directors say their graduates should be able to demonstrate by completion of formal education, by percentage of total respondents

Brief Intervention: 30- to 60-second intervention; Ask, Advise, and Refer

Moderate Intervention: 5- to 15-minute intervention; 5 As, 5 Rs, brief motivational interviewing

Intensive Intervention: 20-minute intervention; multiple sessions, 5 As, 5 Rs, motivational interviewing

Although program directors reported using varied and diverse tobacco education resources, textbooks were still the primary resource in dental hygiene curricula. Because of this, decisions made by authors and editors of dental hygiene textbooks have a large effect on what is included in dental hygiene curricula. This is consistent with the focus on didactics over clinical application noted in the responses to this survey.

Dental hygiene education has traditionally made good use of a model for knowledge and skills acquisition that moves from classroom instruction to demonstration, practice, and competency evaluation in a lab setting, and finally to some level of formal or informal competency evaluation in a clinic setting. In contrast, the reported assessment of clinical competence for tobacco counseling is inconsistent with this model. Most, but not all, programs reported formally assessing whether a student can associate clinical findings with tobacco use and whether tobacco is used by the patient. Unfortunately, the rest of tobacco cessation competencies are formally assessed by only a minority of programs. One explanation may be that clinical faculty members have not received the training necessary to assess tobacco counseling and do not feel confident in providing this level of assessment. Stockdale et al. found that following faculty development and training, faculty members were more confident in their TDE endeavors.¹⁸

Interestingly, almost two-thirds of the responding program directors indicated their support for a moderate level of intervention, defined on the survey as considerably more intensive than the brief intervention, equivalent to Ask, Advise, Refer. A brief intervention is a strong foundation on which educators could build, but is only a beginning to helping patients stop tobacco use. In a recent study, Hanioka et al. reported that dental patients achieved a 36 percent abstinence rate at twelve months after receiving an office-based intensive intervention.²⁷

Conclusions and Recommendations

Dental hygiene programs (and likely all dental programs) may need assistance in learning how to apply the various components of the U.S. Public Health Service guideline as menu options to be chosen depending on the needs of the patient. We propose a Level of Care model, congruent with the

three levels of competence described in the survey. The first level of care would be the Brief Level, similar to the ADHA's Ask, Advise, Refer initiative. The Moderate Level would encompass the Public Health Service guidelines. The Intensive Level would be attained through postgraduate courses or continuing education courses for certification as a tobacco-treatment specialist (CTTS).²⁵ This model would provide educators and students with some definition and flexibility in choosing how to approach TDE. The successful demonstration of knowledge, attitudes, and skills leading to clinical competence is an essential educational component not only in dental hygiene but in other health care professions.³⁵⁻³⁸ In order for dental hygienists to be competent in providing effective tobacco interventions, a strong foundation of knowledge *and* clinical practice must be obtained during professional training. Though dental hygiene educators struggle with an already overcrowded curriculum, training students to competence in the Brief Level and, even better, in the Moderate Level could positively impact patients' tobacco use, which could reduce rates of oral cancer, periodontitis, impaired healing, implant failure, and dental caries in children exposed to environmental tobacco smoke. The multilevel tobacco-cessation intervention (Brief, Moderate, and Intensive) gives both the educator and the clinician flexibility needed in educational and clinical practice settings.

In this study, dental hygiene programs on the whole were found to provide a high number of hours devoted to tobacco cessation education. Most program directors considered that their students should be competent to provide a moderately intense tobacco cessation education intervention. In contrast, programs did not consistently and formally evaluate tobacco cessation education competence in their students.

The findings of this study lead us to make the following recommendations. Dental hygiene programs should:

1. Shift some curriculum time away from didactic training in oral pathology related to tobacco use, and spend more resources on training students to clinical competence at least in the Brief Intervention level.
2. Commit to train students to competence in the Moderate Intervention level, which would include strategies to help and support patients as they quit, especially with the use of medication support and brief motivational interviewing techniques to assist patient efforts.

3. Imbed information and activities on tobacco dependence medication, counseling skills (brief motivational interviewing), and relapse prevention throughout the curriculum.
4. Pursue faculty development (didactic and clinical) leading to clinical competence to at least the moderate level of care. Encourage at least one faculty member in each program to obtain tobacco treatment certification training.

REFERENCES

1. Centers for Disease Control and Prevention. Cigarette smoking among adults and trends in smoking cessation, United States, 2008. *MMWR Morb Mortal Wkly Rep* 2009;58(44):1227–32.
2. Substance Abuse and Mental Health Services Administration. Results from the 2007 national survey on drug use and health: detailed tables. Smokeless tobacco use in the United States. Rockville, MD: Substance Abuse and Mental Health Services Administration, Office of Applied Studies, 2007. At: www.cdc.gov/tobacco/data_statistics/fact_sheets/smokeless/smokeless_facts/#use. Accessed: November 11, 2009.
3. Centers for Disease Control and Prevention. Youth risk behavior surveillance—United States, 2007. *MMWR Morb Mortal Wkly Rep* 2007;57(SS-4):1–136.
4. Johnson GK, Guthmiller JM. The impact of cigarette smoking on periodontal disease and treatment. *Periodontol* 2000 2007;44:178–94.
5. Vered Y, Livny A, Zini A, Sgan-Cohen HD. Periodontal health status and smoking among young adults. *J Clin Periodontol* 2008;35:768–72.
6. Strietzel FP, Reichart PA, Kale A, Kulkarni M, Wegner B, Kuchler I. Smoking interferes with the prognosis of dental implant treatment: a systematic review and meta-analysis. *J Clin Periodontol* 2007;34(6):523–44.
7. Chambrone L, Chambrone D, Pustiglioni FE, Chambrone LA, Lima LA. The influence of tobacco smoking on the outcomes achieved by root-coverage procedures. *J Am Dent Assoc* 2009;140:294–306.
8. Dietrich T, Maserejian NN, Joshipura KJ, Krall EA, Garcia RI. Tobacco use and incidence of tooth loss among U.S. male health professionals. *J Dent Res* 2007;86(4):373–7.
9. Hanioka T, Nakamura E, Ojima M, Tanka K, Aoyama H. Dental caries in 3-year-old children and smoking status of parents. *Paediatr Perinat Epidemiol* 2008;22(6):546–50.
10. Leroy R, Hoppenbrouwers K, Jara A, Declerck D. Parental smoking behavior and caries experience in preschool children. *Community Dent Oral Epidemiol* 2008;36(3):249–57.
11. Fried JL, Rubinstein-DeVore L. Tobacco use cessation curricula in U.S. dental schools and dental hygiene programs. *J Dent Educ* 1990;54(12):730–5.
12. Grinstead CL, Dolan TA. Trends in U.S. dental schools' curriculum content in tobacco use cessation 1989–93. *J Dent Educ* 1994;58(8):663–7.
13. Barker GJ, Williams KB. Tobacco use cessation activities in U.S. dental and dental hygiene student clinics. *J Dent Educ* 1999;63(11):828–33.
14. Weaver RG, Whittaker L, Valachovic RW, Broom A. Tobacco control and prevention effort in dental education. *J Dent Educ* 2002;66(3):426–9.
15. Davis JM, Stockdale MS, Cropper M. The need for tobacco education: studies of collegiate dental hygiene patients and faculty. *J Dent Educ* 2005;69(12):1340–52.
16. Fiore MC, Jaén CR, Baker TB, Bailey WC, Benowitz N, Curry SJ. Treating tobacco use and dependence: 2008 update—clinical practice guideline. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, 2008.
17. Centers for Disease Control and Prevention. QuickStats: percentage of adults aged ≥18 years who are current smokers, by race/ethnicity—national health interview survey, United States, 1997–2008. *MMWR Morb Mortal Wkly Rep* 2009;58(49):1385.
18. Stockdale MS, Davis JM, Cropper M, Vitello EM. Factors affecting adoption of tobacco education in dental hygiene. *J Cancer Educ* 2006;21:253–7.
19. Wewers ME, Kidd K, Armbruster D, Sarna L. Tobacco dependence curricula in U.S. baccalaureate and graduate nursing education. *Nurs Outlook* 2004;52:95–101.
20. Hornberger CA, Edwards LC. Survey of tobacco cessation curricula in Kansas nursing programs. *Nurs Educ* 2004;29(5):212–6.
21. Houston LN, Warner M, Corelle RL, Fenlon CM, Hudmon K. Tobacco education in U.S. physician assistant programs. *J Cancer Educ* 2009;24(2):107–13.
22. Montalto NJ, Ferry LH, Stanhiser T. Tobacco dependence curricula in undergraduate osteopathic medical education. *J Am Osteopath Assoc* 2004;104(8):317–23.
23. Ferry LH, Grissino LM, Runfola PS. Tobacco dependence curricula in U.S. undergraduate medical education. *JAMA* 1999;282(9):825–9.
24. Davis JM. Tobacco cessation. In: Harris NO, Garcia-Godoy F, Nathe CN, eds. *Primary preventive dentistry*. Upper Saddle River, NJ: Pearson Publishing Co., 2009:364–86.
25. Davis JM, Ramseier CA, Matheos N, Schoonheim-Klein, Compton S, Al-Hazmi N, et al. Education of tobacco use prevention and cessation for dental professionals: a paradigm shift. *Int Dent J* 2010;60:60–72.
26. Lancaster T, Stead LF. Physician advice for smoking cessation. *Cochrane Database Syst Rev* 2008;2:CD000165.
27. Hanioka T, Ojima M, Tanaka H, Naito M, Hamajima N, Matsuse R. Intensive smoking-cessation intervention in the dental setting. *J Dent Res* 2010;89(1):66–70.
28. American Dental Hygienists' Association. Tobacco cessation protocols for the dental practice. At: www.askadviserefer.org/downloads/Tobacco_Cessation_Protocols.pdf. Accessed: January 13, 2010.
29. Davis JM. Tobacco free! curriculum. At: www.sah.siuc.edu/tobacco. Accessed: February 4, 2010.
30. Hudmon KS, Corelli RL, Chung E, Gundersen B, Kroon LA, Sakamoto LM, et al. Development and implementation of a tobacco cessation training program for students in healthcare professions. *J Cancer Educ* 2003;18(3):142–9.
31. Crews KM, Sheffer CE, Payne TJ, Applegate BW, Martin A, Sutton T. A survey of oral and maxillofacial surgeons' tobacco-use-related knowledge, attitudes, and intervention behaviors. *J Am Dent Assoc* 2008;139(12):1643–51.

32. Applegate BW, Sheffer CE, Crews KM, Payne TJ, Smith PO. A survey of tobacco-related knowledge, attitudes, and behaviors of primary care providers in Mississippi. *J Eval Clin Pract* 2008;14:537–44.
33. Hu S, Pallonen U, McAlister AL, Howard B, Kaminski R, Stevenson G, et al. Knowing how to help tobacco users: dentists' familiarity and compliance with the clinical practice guideline. *J Am Dent Assoc* 2006;137(2):170–9.
34. Gansky SA, Ryan JL, Ellison JA, Isong U, Miller AJ, Walsh MM. Patterns and correlated of tobacco control behavior among American Association of Pediatric Dentistry members: a cross-sectional national study. *BMC Oral Health* 2007;7(13):1–10.
35. Commission on Dental Accreditation. Accreditation standards for dental hygiene education programs. Chicago: American Dental Association, 2010. At: www.ada.org/sections/educationAndCareers/pdfs/dh.pdf. Accessed: March 30, 2010.
36. Licari FW, Chambers DW. Some paradoxes in competency-based dental education. *J Dent Educ* 2008;72(1):8–18.
37. Lenburg CB. The framework, concepts, and methods of the competency outcomes and performance assessment (COPA) model. *Online J Issues Nurs* 1999;4(2). At: www.nursingworld.org/MainMenuCategories/ANA-Marketplace/ANAPeriodicals/OJIN/TableofContents/Volume41999/No2Sep1999/COPAModel.aspx?css=print. Accessed: February 2, 2010.
38. Wass V, Vander der Vleuten C, Shatzer J, Jones R. Assessment of clinical competence. *Lancet* 2001;357:945–9.