

Evidence-based Tobacco Cessation Treatment by Dental Hygienists

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Introduction

Cigarette smoking continues to be the number one preventable cause of death in the United States, with approximately 20% of deaths annually due to smoking-related diseases.^{1,2} In addition to influencing mortality, tobacco use is linked to cancer, heart disease, stroke and oral disease.³⁻⁵ While the percentage of U.S. adults who report tobacco use has decreased significantly in recent decades, 19.8% currently report cigarette smoking.^{6,7} Given the health consequences cited above and economic losses associated with tobacco-related disease, tobacco use warrants attention from health care providers in all areas, including dental hygiene and dental professionals.^{2,8,9}

The dental office is uniquely suited for tobacco education and cessation intervention for several reasons. First, many tobacco users visit a dental office each year, which means dental hygiene-based interventions would have broad reach.^{10,11} Second, because oral health care usually requires multiple visits, dental hygiene professionals are afforded multiple opportunities to intervene with patients.¹² Third, some oral and dental procedures allow an opportunity to demonstrate visibly the association between tobacco use and oral health, which has been shown to motivate tobacco-using patients to make a quit attempt.^{9,13} Overall, incorporating standardized and routine tobacco cessation treatment into dental offices is a cost-effective method of reaching a large number of tobacco users, and could have a positive and significant public health impact.¹³

Abstract

Purpose: Dental hygienists have opportunities to take a substantive role in tobacco control efforts. Previous research has suggested that implementation of tobacco cessation strategies has been sub-optimal, but few studies have examined factors associated with dental hygienists' delivery of evidence-based tobacco cessation treatment. Among dental hygienists, the current study investigated tobacco-related knowledge and attitudes, as well as clinical practices consistent with evidence-based guidelines for tobacco cessation.

Methods: Practicing dental hygienists in the state of Kentucky (n=308) responded to a paper and pencil questionnaire that collected information regarding their demographic, clinical characteristics and knowledge, attitudes and clinical practices regarding tobacco cessation treatment.

Results: Participants were somewhat familiar with evidence-based clinical practice guidelines regarding tobacco cessation treatment, but reported infrequent implementation of the 5 A's (Ask, Advise, Assess, Assist, Arrange). While participants were well aware of health risks associated with tobacco use and the value of cessation, few reported comfort or confidence in their ability to employ evidence-based interventions. However, several key variables were associated with implementation of recommended clinical practices (guideline awareness, comfort with specific tobacco cessation activities and self-efficacy).

Conclusion: Results identified potential deficiencies in areas of tobacco control knowledge and confidence among dental hygienists. Correlations with evidence-based tobacco control practices suggest that knowledge and attitudes could serve as targets for education and training programs to promote greater implementation. While dental hygienists have unique opportunities to reduce tobacco-related morbidity and mortality, more education and training is necessary to increase adoption, implementation and sustainability of these important interventions.

Keywords: dental hygienists, evidence-based practice, smoking cessation, public health

This study supports the NDHRA priority area, **Clinical Dental Hygiene Care:** Studies in this category address the dental hygiene process of care (assessment, diagnosis, treatment planning, implementation and evaluation); decision-making and clinical reasoning; and data management systems.

As reviewed by Warnakulasuriya, several studies have evaluated the willingness of oral health care professionals, including dental hygienists, to provide tobacco education and cessation interventions to their patients.¹⁴ In one study, dental hygienists who received training in tobacco cessation treatment during their formative education were questioned about the frequency in which they provide such services.¹⁵ Study findings suggested that nearly 95% of dental hygienists do not regularly ask about patients' tobacco use status, assist patients who are willing to quit or arrange a follow-up, despite having specific training that prepared them to do so. Slightly more positive results were found among dental hygienists and other dental professionals who agreed to participate in the National Cancer Institute's tobacco education and cessation training program, though the percentage of persons conforming to evidence-based clinical practice guidelines was still low.¹⁶ If one aggregates research results on the subject,¹⁴⁻¹⁷ it appears dental hygienists have not widely adopted the guidelines described in the U.S. Public Health Service's Treating Tobacco Use and Dependence: Clinical Practice Guideline (TTUD-CPG).¹⁸

Barriers to routine implementation of tobacco cessation treatment by dental hygienists may be linked to sub-optimal training opportunities. Insufficient knowledge on the subject among dental hygienists may be a consequence of a lack of tobacco prevention and control training within the dental hygiene curriculum.^{14,19} Limited knowledge and comfort with tobacco cessation treatment is important because inaccurate knowledge has been associated with not following evidence-based clinical practice guidelines.¹² Thus, knowledge appears to be a significant barrier to the provision of tobacco education and cessation intervention. In addition, attitudinal barriers involving implementation of tobacco cessation interventions exist among dental hygienists.^{12,14,16} Perceived resistance on the part of the patient, and concerns that tobacco cessation treatment is beyond the scope of dental practice, likely preclude intervention with tobacco-using patients.^{9,16} O'Shea and colleagues found that 85% of dental hygienists believe patients will not quit their tobacco use, even if their health care provider advises them to do so.²⁰ Thus, concerns about the effectiveness of intervention and low to moderate self-efficacy about one's ability to carry out tobacco cessation treatment may contribute further to dental hygiene professionals' inconsistent provision of tobacco cessation treatment.^{12,21} Perceived time constraints and lack of reimbursement have also been reported as barriers to intervening with tobacco-using patients.^{14,16}

Several barriers to implementation of tobacco education and cessation intervention by dental hy-

gienists have been identified. However, many of these barriers can be adequately addressed with intervention.^{9,16,22} Attempts to increase dental hygienists' adoption of evidence-based tobacco cessation treatment should not be abandoned. Results of randomized controlled trials indicate dental hygienists can be effective in helping their patients quit using tobacco.^{13,23-25} Thus, dental hygienists are a seemingly underused resource for tobacco control.

Specific Aims

The primary aim of this study is to describe knowledge, attitudes and clinical practices related to treatment of tobacco use and dependence among dental hygienists in Kentucky. The secondary aim is to explore correlates of clinical practices consistent with the TTUD-CPG,¹⁸ thereby assessing a more comprehensive array of variables that could be associated with the implementation of evidence-based clinical practices than has been done in the past. By systematically assessing the differences between evidence-based guidelines and dental hygienists' current clinical practices regarding tobacco cessation treatment, this study may assist in the development of educational and training programs.

Methods and Materials

Procedure

All licensed, practicing dental hygienists in Kentucky were notified of the opportunity to participate in the Kentucky Cancer Program's Providers Practice Prevention: Treating Tobacco Use and Dependence (PPP-TTUD) continuing education program. The program was offered through direct mail. Additional notification efforts included articles in trade journals, newsletters and conference presentations. Individuals expressed interest in program participation by contacting the Kentucky Cancer Program and subsequently received materials by mail.

To evaluate the current state of knowledge, attitudes and clinical practices among dental hygienists in the state of Kentucky, data analysis was limited to data collected prior to PPP-TTUD program participation. A request to analyze de-identified archival data was approved by the Human Studies Committee at the University of Louisville.

Participants

Of the 1,671 dental hygienists who received direct notification of the PPP-TTUD program, 485 (29%) ordered the kit, and 308 completed the pre-program survey. Thus, the sample included 18% of all dental hygienists in Kentucky. Years of

practice ranged from 0.5 to 44 years (mean=13.9, sd=10.5), and 1 participant was male (0.3%). Participants practiced in suburban (45%), rural (38%) and urban areas (13%). Fourteen participants (5%) indicated that they were not currently seeing patients. Data from these participants were excluded from analyses involving current clinical practices.

Measures

The survey included questions assessing knowledge, attitudes and clinical practices regarding tobacco cessation treatment. Additional items assessed participants' demographic characteristics and practice setting.

Tobacco cessation knowledge

Tobacco use and cessation knowledge questions included 5 subjective and 8 objective items. With regard to subjective knowledge, participants were asked to rate their comfort discussing tobacco cessation with a patient, helping the patient develop a tobacco cessation plan and recommending pharmacotherapy, using scales ranging from 1 (not at all comfortable) to 4 (very comfortable). A fourth question asked participants to rate their knowledge of pharmacotherapy on a scale from 1 (not very knowledgeable) to 5 (very knowledgeable). The fifth subjective item assessed TTUD-CPG awareness.

To assess objective knowledge, 8 items employed a multiple choice format with 4 response options. Items were scored dichotomously as correct or incorrect, with objective knowledge test scores having a possible range of 0 to 8. Knowledge-based items targeted tobacco use facts conveyed in the PPP-TTUD program video and TTUD-CPG.

Tobacco cessation attitudes

Five survey questions assessed current attitudes toward tobacco cessation using items from the Risk Behavior Diagnosis Scale.²⁶ On a scale from 1 (strongly disagree) to 4 (strongly agree), participants indicated their perception of the susceptibility of their patients to mortality and morbidity resulting from tobacco use, the severity of this threat, their own self-efficacy to address the threat (the belief in their own ability to implement cessation interventions) and 2 aspects of response efficacy regarding recommended interventions (the belief in the efficacy of tobacco cessation treatment in general and in brief clinician intervention, specifically). A sixth question asked participants to indicate which of the 5 barriers limited counseling tobacco users during every visit.

Tobacco cessation treatment practices: The 5 A's

Eight questions addressed clinical practices involving the 5 A's.¹⁸ The first 3 questions focused on whether every tobacco user was identified, how tobacco use status was tracked and how often participants asked patients about tobacco use. The fourth question assessed how often participants advised tobacco users to quit, and the fifth asked when they assessed willingness to quit. The sixth question listed methods of assisting patients to quit tobacco use (e.g., educational materials), and asked participants to indicate the frequency with which they employed each method. The seventh question listed outside resources (e.g., telephone quit lines), and asked participants to identify where they referred patients for further assistance. Finally, participants indicated which methods they used to arrange follow-up.

Statistical Analyses

To address the first study aim, descriptive statistics were calculated to portray participant knowledge, attitudes and clinical practices regarding the treatment of tobacco use and dependence. To address the second aim, bivariate correlations were used to describe the relationship between reported implementation of evidence-based clinical practices and participant demographic information, knowledge and attitudes. A 2 sided alpha of 0.05 was used to determine the statistical significance of all correlations.

Results

Knowledge of Tobacco Use and Cessation Treatment

More than half of participants (60%) reported they had never heard of the TTUD-CPG, and 28% had heard of the guideline but had never read it. Less than 2% of participants reported routinely following TTUD-CPG recommendations. While most were either somewhat (63%) or very comfortable (19%) discussing tobacco cessation with their patients, participants were reportedly less comfortable formulating a quit plan or recommending pharmacotherapy. Fifty-three percent of dental hygienists were either not at all comfortable helping patients develop a tobacco cessation plan or not too comfortable doing so (14% and 39%, respectively). Similarly, 58% reported being not at all comfortable or not too comfortable recommending pharmacotherapy to patients making a quit attempt (24% and 34%, respectively). Average subjectively-rated pharmacotherapy knowledge was 2.17 (sd=0.99),

Table I: Correct Responses to the Objective Knowledge Test (N=307)

Test Items	Frequency (%)
Smoking rates of Kentucky high school students (33%)	175 (57)
Failure rates of unaided quit smoking attempts (90–95%)	150 (49)
Rates of current smokers who have expressed a desire to quit (70%)	108 (35)
Approach not recommended for patients unwilling to quit (Encourage patient to cut back on cigarettes)	211 (69)
Most common age of initiation of tobacco experimentation (11–12 years old)	177 (58)
First-line pharmacologic agents for tobacco cessation (Nicotine replacement, bupropion – not Clonidine)	191 (62)
Recommended follow-up approaches (Scheduled office visit, phone call, mailed letter/card)	230 (74)
Specific practice recommended in the TTUD-CPG (Identify tobacco use status at every visit)	226 (73)

on a scale from 1 to 5, indicating minimal knowledge.

The 8 objective knowledge items were based on facts regarding tobacco use and cessation treatment. Results indicated a mean knowledge score of 4.76 (sd=1.68), ranging from 0 to 8 total correct responses. As shown in Table I, the majority of participants correctly answered 6 of the 8 items. However, none of the items were correctly answered by more than three-quarters of the sample.

Attitudes toward Tobacco Use and Cessation Treatment

Participants strongly agreed with the importance of discussing tobacco use with patients (87%) and the seriousness of tobacco's health consequences (98%). Almost all participants also strongly agreed that tobacco cessation in general is effective in reducing morbidity and mortality (response efficacy: 84%). However, fewer agreed that a brief, 3 minute intervention would be effective for tobacco cessation (strongly agree: 33%, somewhat agree: 51%). Eight percent strongly agreed and 50% somewhat agreed that they possessed the skills and knowledge to treat nicotine dependence (self-efficacy).

When reporting specific barriers to counseling tobacco users and applying tobacco cessation strategies, participants identified an average of 1.45 of 5 barriers (sd=0.74). Participants cited 2 factors substantially more often than others: the perception that tobacco cessation is a low priority for patients (58%), and time constraints (57%). Additionally, 24% of participants endorsed as a barrier the belief that patients might seek another provider if tobacco cessation was discussed. The remaining factors were cited by fewer than 3% of participants.

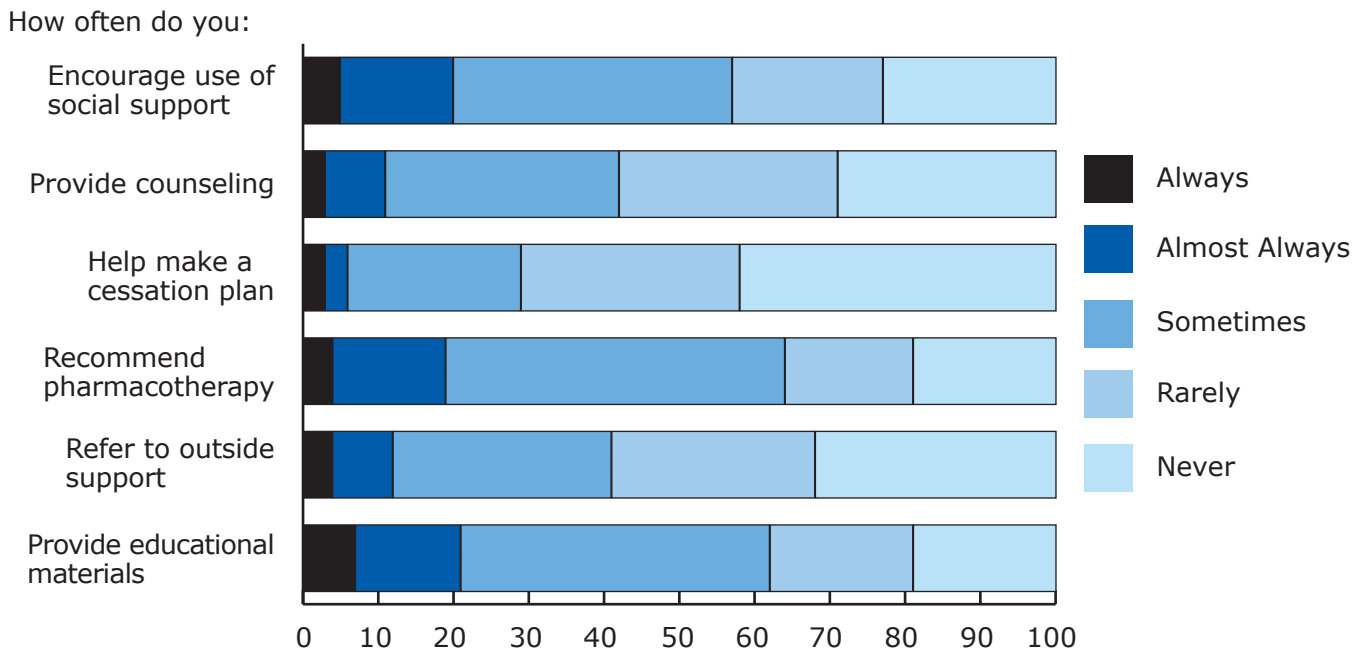
Clinical Practices Regarding Treatment of Tobacco Use and Dependence

Ask: Eight percent of participants reported they always identify the tobacco use status of every patient, while 40% reported they almost always identify the use of every patient. Six percent of participants reported generally not asking each patient about tobacco use, and 24% reported having no routine method. The most common method of identifying tobacco-using patients included having patients complete a medical history form (67%) or verbally asking patients during examination/consultation (65%). Only 8% reported recording tobacco use as a vital sign at every visit.

Advise and Assess: Participants indicated they almost always (41%) or sometimes (35%) advised tobacco-using patients to quit. Thirty-three percent of participants reported assessing patient willingness to quit during routine check-ups, but this was followed by 24% of participants having no routine method of assessing patient willingness to quit. Only 13% reported assessing patient willingness at every visit, 13% reported assessing only at the initial visit and 12% reported assessing when patients present with a tobacco-related problem. A minority (6%) indicated not assessing this factor at all.

Assist: As depicted in Figure 1, participants reported relatively infrequent use of assist methods. The most common response for 4 of the 6 assist methods was "sometimes," and ranged from sometimes providing practical counseling (31%) to sometimes recommending pharmacotherapy (45%). "Never" was the most common response to assisting with a cessation plan (43%) and referring to outside sources of support (32%).

Figure 1: Frequency (in %) of Assisting Patients Willing to Quit (N=286)



Consistent with reported use of assist methods, very few participants indicated they made referrals to additional cessation resources. Fifty-nine percent reported they did not refer patients for tobacco cessation assistance. Of those that offered referrals, the most commonly reported efforts involved cessation support groups or classes (26%), followed by individual therapy (15%), cessation Web sites (5%), inpatient cessation programs (3%) and telephone quit lines (2%).

Arrange: Even fewer participants indicated arranging a follow-up with patients – only 14% reported any type of follow-up procedure.

Correlates of Clinical Practices Regarding Treatment of Tobacco Use and Dependence

To examine associations with clinical practices recommended in the TTUD-CPG, 3 sets of variables were correlated with responses to items regarding the 5 A's: demographic characteristics, knowledge factors and attitudinal variables. Only 1 demographic factor was associated with any of the 5 A's. Participants who practiced in a rural setting were significantly more likely to Ask than participants practicing in suburban or urban settings ($\chi^2 (2, N=280)=7.76, p=.02$).

As shown in Table II, participants' report of clinical practices consistent with the 5 A's were significantly and positively associated with the following variables: perceived knowledge of pharmacotherapy (median correlation=0.30), comfort discussing tobacco cessation (median correlation=0.27),

developing a quit plan with tobacco-using patients (median correlation=0.22), comfort recommending pharmacotherapy (median correlation=0.17), self-efficacy (median correlation=0.15), awareness of the TTUD-CPG (median correlation=0.15) and perceived risk of tobacco use (median correlation=0.15).

Discussion

Healthy People 2010 identified dental hygiene and dental professionals as key practitioners in the effort to meet public health goals for treatment of tobacco use and dependence.²⁷ In particular, dental hygienists are a viable and vital channel for decreasing tobacco-related morbidity and mortality. Since dental hygienists are trained extensively in providing oral health education,⁹ incorporating information on the oral health effects of tobacco use and intervening with tobacco-using patients can be viewed as an extension of their unique skill set. To increase the likelihood dental hygienists implement evidence-based clinical practices, tobacco cessation training has been advocated by the American Dental Hygienists' Association, and recommendations have been made to include tobacco-related training as part of the dental hygiene curriculum.^{10,28} By implementing evidence-based clinical practice guidelines outlined in the TTUD-CPG, dental hygienists have the greatest chance to maximize their impact on reducing tobacco-related morbidity and mortality. For this to be accomplished, dental hygienists must receive training in evidence-based tobacco cessation treatment and feel comfortable and confident in their ability to in-

Table II: Correlates of Clinical Practices Consistent with TTUD-CPG 5 A's (N=308)

Knowledge Variables	TTUD-CPG 5 A's					
	Ask*	Advise†	Assess*	Assist-Cessation†	Assist-Referral*	Arrange*
TTUD-CPG Awareness	.16‡	.14§	.02	.21**	.16‡	.16‡
Pharmacotherapy Knowledge	.32**	.31**	.26**	.39**	.21**	.30**
Comfort Discussing Cessation	.33**	.49**	.31**	.23**	.20**	.13§
Comfort Develop. Cessation Plan	.26**	.30**	.18‡	.32**	.15§	.09
Comfort Rec. Pharmacotherapy	.22**	.19‡	.15§	.27**	.15§	.14§
Objective Knowledge Score	.04	.11	.11	.02	.16‡	.03
Attitudinal Variables						
Perceived Risk	.15§	.20**	.15§	.11	.16‡	.01
Perceived Severity	.07	-.05	-.07	-.04	.00	-.10
Self-Efficacy	.15§	.25**	.15§	.25**	.11	.17‡
Response Efficacy - Cessation	.05	.10	.05	.06	.05	-.01
Response Efficacy - Brief	.05	.17‡	.05	.04	.04	-.02
Perceived Barriers	.02	-.13§	-.02	-.06	.02	.02

*Spearman correlations (rho) †Pearson correlations (r)

‡p ≤ .01

§p ≤ .05

**p ≤ .001

tervene with patients. In this way, knowledge and attitudes regarding tobacco cessation intervention are considered important variables when promoting implementation of evidence-based clinical practices among dental hygienists.

Ample opportunities remain to achieve optimal implementation of evidence-based practices by dental hygienists. Consistent with previous research, results showed that dental hygienists reported a higher rate of adherence to TTUD-CPG regarding tobacco use and dependence assessment (i.e., Ask, Advise, Assess) than implementation of tobacco cessation treatment (i.e., Assist and Arrange).¹⁴⁻¹⁷ While half of the participants reported asking about patients' tobacco use status at every visit, 25% reported having no routine method of doing so. Without standardized assessment procedures, it is unlikely dental hygienists will fully appreciate opportunities to provide subsequent interventions to support tobacco cessation. While the majority of participants reported advising tobacco-

using patients about cessation, the frequency of doing so was inconsistent with TTUD-CPG recommendations. Assessing patient willingness to quit, which allows for tailored intervention, was accomplished infrequently by study participants. Finally, results showed that assisting those patients making a quit attempt and arranging follow-up care was not performed by most dental hygienists in this study.

Lack of implementation of evidence-based tobacco treatment strategies could be related to several factors. First and foremost, dental hygienists in this study reported little awareness of the TTUD-CPG, a notable dissemination concern for guideline advocates and an educational issue for training programs. Interestingly, participants reported greater comfort assessing the tobacco use status of patients than intervening with those patients willing to make a quit attempt. The differential level of comfort probably explains the observed difference in the extent to which participants engaged in the

Ask, Advise and Assess practices as compared to Assist and Arrange. Thus, it is thought that efforts to disseminate evidence-based clinical practice recommendations and to promote greater comfort with each of the 5 A's may lead to increased adoption of the Assist and Arrange phases.

Regarding objective knowledge, participants' general amount of tobacco use and control information was promising. However, as is common in prevention research, factual knowledge did not readily translate into practice. Particular areas of concern included participants' knowledge of the percentage of tobacco users who desire cessation and failure rates associated with unaided quit attempts. These 2 points are critically important because they are potentially significant barriers to implementation. First, underestimating the percentage of tobacco users with a desire to quit smoking likely explains a frequently endorsed barrier to tobacco cessation treatment in dental hygienists – the belief that tobacco cessation is not a priority for their patients. Second, over-estimating the efficacy of unaided quit attempts is likely another explanation why dental hygienists implement the behavior change-oriented components of the 5 A's less often than recommended. Effectively addressing these 2 areas could result in fewer missed opportunities to intervene with patients, ultimately leading to greater tobacco control.

Consistent with the American Dental Hygienists' Association's position on the subject,²⁸ dental hygienists in this study clearly reported favorable attitudes recognizing the importance of discussing tobacco use and its ill-effects with patients. Yet participants' level of response efficacy regarding tobacco cessation treatment was moderate, and confidence in their ability to carry out such practices was less so. In other studies, dental hygienists reported low to moderate belief in the effectiveness of tobacco cessation treatments,^{12,21} despite accumulating empirical support for dental office-based intervention.^{13,18,23,29} The identification of several barriers to routine implementation of tobacco cessation treatment found in this study is consistent with previous reports.^{14,16} This suggests that important points of intervention among dental hygienists include addressing the misconception that patients will respond negatively to discussion of tobacco cessation, as well as highlighting the fact that effective tobacco cessation treatment can be accomplished within the constraints of a standard dental hygiene appointment.^{25,30} Developing continuing education programs, encouraging use of available Web resources (e.g., www.askadviserefer.org or smokingcessationleadership.ucsf.edu) and integrating additional training modules that enhance

comfort and confidence regarding evidence-based tobacco treatment would likely enhance integration of these key tobacco control strategies into standard clinical practice regimens.

Results of this study should be interpreted in light of some considerations. First, the data relied on was self-reported, which has been common among studies of this kind. Therefore, future research should consider incorporating objective measures of dental hygienists' clinical practices (e.g., chart review, patient report) to cross-validate self-reported data. Second, self-selection to participate in the PPP-TTUD program may be considered a study limitation because results may not generalize well to the broader population of dental hygienists. On the other hand, results from this study may be used to inform the development of interventions that are tailored to individuals interested in conforming to evidence-based guidelines. Further, comparisons between results of the current study and those of other studies are largely consistent and lend credibility to the current data.

Beyond the above limitations, there are several strengths of the current study. First, this study employed comprehensive assessment of factors related to tobacco cessation interventions. By measuring subjective and objective knowledge, attitudes (i.e., self-efficacy, response-efficacy, perceived barriers) and clinical practices, this study adds significantly to the current knowledge base. Second, this study included a large sample size relative to most other studies in this area. Third, the study collected data regarding participants' demographic and practice characteristics, which allowed the evaluation of whether such characteristics were related to dental hygienists' clinical practices. Fourth, results of the current study can be used to inform development of interventions designed to increase dental hygienists' adoption of evidence-based tobacco cessation interventions.

Conclusion

The results of this study found that dental hygienists in Kentucky showed sub-optimal awareness of evidence-based guidelines for tobacco control, as well as low levels of comfort and confidence in implementing the 5 A's. Consistent correlations between measures of knowledge and attitudes (e.g., guideline awareness, perceived knowledge of pharmacotherapy and comfort and confidence in treating tobacco), with implementation of evidence-based practices, suggest that interventions could target these parameters to increase tobacco control efforts by dental hygienists. It is recommended that effective means of increasing knowl-

edge about pharmacotherapy, comfort in discussing and developing tobacco cessation plans, as well as enhancing self-efficacy, should be developed to promote the knowledge and attitudes necessary to expand dissemination and implementation of efficacious tobacco use and cessation interventions among dental hygienists.

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References

1. Department of Health and Human Services. Targeting tobacco use: the nation's leading cause of preventable death. U.S. Public Health Service [Internet]. 2008 [cited 2008 July 1]. Available from: <http://www.cdc.gov/nccdphp/publications/aag/pdf/osh.pdf>
2. Fellows J, Trosclair A, Adams E, Rivera C. Annual smoking-attributable mortality, years of potential life lost, and economic costs—United States, 1995–1999. *MMWR Morb Mortal Wkly Rep.* 2002;51(14):300–303.
3. American Cancer Society. Cancer facts and figures 2008. Atlanta. American Cancer Society. 2008.
4. Winn DM, ed. Surveillance of and knowledge about cancer associated with smokeless tobacco use. National Cancer Institute, National Institutes of Health. 1993.
5. Jansson L, Lavstedt S. Influence of smoking on marginal bone loss and tooth loss—a prospective study over 20 years. *J Clin Periodontol.* 2002;29(8):750–756.
6. Rodu B, Cole P. Declining mortality from smoking in the United States. *Nicotine Tob Res.* 2007;9(7):781–784.
7. Centers for Disease Control and Prevention. Cigarette smoking among adults – United States 2004. *MMWR Morb Mortal Wkly Rep.* 2005;54(44):1121–1124.
8. Department of Health and Human Services. The health consequences of smoking: A report of the Surgeon General. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion. 2004.
9. Gordon JS, Severson HH. Tobacco cessation through dental office settings. *J Dent Educ.* 2001;65(4):354–363.
10. 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):1340–1352.
11. Centers for Disease Control and Prevention. Physician and other health-care professional counseling of smokers to quit—United States, 1991. *MMWR Morb Mortal Wkly Rep.* 1993;42(44):854–857.
12. Albert DA, Severson H, Gordon J, Ward A, Andrews J, Sadowsky D. Tobacco attitudes, practices, and behaviors: a survey of dentists participating in managed care. *Nicotine Tob Res.* 2005;7(Suppl 1):S9–18.
13. Stevens VJ, Severson H, Lichtenstein E, Little SJ, Leben J. Making the most of a teachable moment: a smokeless-tobacco cessation intervention in the dental office. *Am J Public Health.* 1995;85(2):231–235.
14. Warnakulasuriya S. Effectiveness of tobacco counseling in the dental office. *J Dent Educ.* 2002;66(9):1079–1087.

15. Monson AL, Engeswick LM. Promotion of tobacco cessation through dental hygiene education: a pilot study. *J Dent Educ.* 2005;69(8):901-911.
16. Gould KA, Eickhoff-Shemek JM, Stacy RD, Mecklenburg RE. The impact of national cancer institute training on clinical tobacco use cessation services by oral health teams. *J Am Dent Assoc.* 1998;129(10):1442-1449.
17. Wood GJ, Cecchini JJ, Nathason N, Hiroshige K. Office-based training in tobacco cessation for dental professionals. *J Am Dent Assoc.* 1997;128(2):216-224.
18. Fiore M, Jaen C, Baker T, et al. Treating tobacco use and dependence: 2008 update, Clinical Practice Guideline. *Public Health Service.* 2008.
19. Weaver RG, Whittaker L, Valachovic RW, Broom A. Tobacco control and prevention efforts in dental education. *J Dent Educ.* 2002;66(3):426-429.
20. O'Shea R, Sowinski J, Dietrich C, Johnson F, Bleck S. Hygiene students' conceptions of the role of the dental hygienist in smoking cessation. *Health Values.* 1992;16(2):44-50.
21. Gregorio DI. Counseling adolescents for smoking prevention: a survey of primary care physicians and dentists. *Am J Public Health.* 1994;84(7):1151-1153.
22. Gordon JS, Andrews JA, Lichtenstein E, Severson HH, Akers L. Disseminating a smokeless tobacco cessation intervention model to dental hygienists: a randomized comparison of personalized instruction and self-study methods. *Health Psychol.* 2005;24(5):447-55.
23. Andrews JA, Severson HH, Lichtenstein E, Gordon JS, Barckley MF. Evaluation of a dental office tobacco cessation program: effects on smokeless tobacco use. *Ann Behav Med.* 1999;21(1):48-53.
24. Gansky SA, Ellison JA, Kavanagh C, Hilton JF, Walsh MM. Oral screening and brief spit tobacco cessation counseling: a review and findings. *J Dent Educ.* 2002;66(9):1088-1098.
25. Severson HH, Andrews JA, Lichtenstein E, Gordon JS, Barckley MF. Using the hygiene visit to deliver a tobacco cessation program: results of a randomized clinical trial. *J Am Dent Assoc.* 1998;129(7):993-999.
26. Witte K, Cameron KA, McKeon JK, Berkowitz JM. Predicting risk behaviors: development and validation of a diagnostic scale. *J Health Commun.* 1996;1(4):317-341.
27. Department of Health and Human Services. Healthy people 2010: Understanding and improving health. In: Department of Health and Human Services. Washington, DC. Government Printing Office. 2000.
28. Ask. Advise. Refer. American Dental Hygienists Association [Internet]. 2009 [cited 2009 July 28]; Available from: <http://www.askadviserefer.org/>
29. Severson HH. Tobacco cessation in the dental office: a brief intervention for spit tobacco users. *Quintessence Int.* 1998;29(4):262-265.
30. Campbell HS, Sletten M, Petty T. Patient perceptions of tobacco cessation services in dental offices. *J Am Dent Assoc.* 1999;130(2):219-226.