

The Effect of Continuing Education on Dental Hygienists' Knowledge, Attitudes, and Practices Regarding Human Papillomavirus Related Oropharyngeal Cancer

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Abstract

Purpose: The purpose of this study was to investigate the effect a continuing education (CE) course had on dental hygienists' knowledge, attitudes, and practices regarding human papillomavirus (HPV) related oropharyngeal cancer (OPC).

Methods: A two-group, experimental post-test only design was used for this study. Randomly selected, licensed dental hygienists in the state of Florida, were recruited by email and assigned to either an experimental or control group. An investigator designed, questionnaire was developed and tested for validity and reliability. The experimental group received a one-hour web-based CE course on HPV related OPC. Six weeks later, a post-test questionnaire was administered to the experimental and control groups via an online platform, Qualtrics®. Data were analyzed using descriptive statistics and analysis of variance (ANOVA).

Results: Out of 302 dental hygienists who agreed to participate, 133 completed the study for a participation rate of 44.0%. The knowledge score for the experimental group was 72.6% while the control group scored 58.4%. Results demonstrated statistically significant differences between the groups in terms of knowledge ($F=33.81$, $df=1$, $p=0.00$) and attitudes ($F=13.91$, $df=1$, $p=0.00$). No differences were found in oral examination procedures; however, statistically significant differences ($F=7.47$, $df=1$, $p=0.007$) were noted for items related to HPV specific examination practices between the two groups.

Conclusion: Additional research is needed to identify what specific types of educational interventions are effective in increasing the HPV-related OPC knowledge and practice behaviors of dental hygienists.

Keywords: dental hygienists, human papillomavirus, oropharyngeal cancer, knowledge, attitudes, clinical dental hygiene practice

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Introduction

Cancer is a worldwide health problem and the second leading cause of death in the United States (U.S.), surpassed only by heart disease.¹ Surveillance data projected that in 2018, more than 51,000 Americans would develop oral cancer (OC) and oropharyngeal cancer (OPC), and that 10,030 would die from these cancers.^{2,3} Although treatment and responses greatly vary, the percentage of patients surviving five years post OC and OPC diagnosis from 2007-2013 was 64.5%.³ With approximately 70% of these cancer diagnoses occurring in later stages,¹ the need for early detection, consisting of examination, practitioner education, and early diagnosis leading to early treatment and mortality reduction, is further supported.^{4,5}

The human papillomavirus (HPV), a common oral infection, has surpassed tobacco and alcohol as the major risk factor for oral cancer,⁴ and has been identified in up to 75% of OPCs.⁴ Human papillomavirus is comprised of more than 150 strains or types; one type in particular, HPV 16, is associated with most OPCs.^{4,6-8} Although the virus currently infects about one in four persons in the U.S.,¹ it typically clears or resolves on its own by the body's immune system and does not cause health problems.^{9,10} When a HPV infection does not resolve however, cancer can result.¹⁰

The HPV is transferred from person to person (e.g. male/male, male/female, female/female) during vaginal, anal, and

oral sex, as well as open mouth kissing.⁶ Research has shown those persons who develop HPV related OPC tend to be white males ages 40 to 70,^{2,11,12} although women can also be affected.^{2,12} Additional risk factors include number and frequency of oral, anal, and vaginal sex encounters, younger age sexual debut, and smoking.^{8,11-16} The anatomy affected by HPV-related OPC includes the tonsils, pharynx, base of the tongue, soft palate, and cervical lymph nodes.^{6,13,17,18} Signs and symptoms for HPV-related OPC include a persistent sore throat, chronic trouble or pain when swallowing, ear pain, hoarseness, an ipsilateral neck mass, and a persistent lump in the throat.^{6,18,19}

A standardized protocol for visual and tactile evaluation has been described by the World Health Organization, American Dental Association, and the National Institute of Dental and Craniofacial Research to include examination of the extra and intra-oral structures including the face, head, neck, lips, labial and oral mucosa, gingiva, floor of the mouth, tongue, soft and hard palate, including the oropharyngeal tissues.^{17,20-23} Although HPV testing is available,^{15,18} there is no evidence supporting a screening test for HPV-related OPC similar to the pap smear for cervical cancer.¹⁸ Additionally, a systematic review conducted by Lingen et al.,⁴ found that adjunct screening tools are not effective in helping to identify early OCs and OPCs. These studies accentuate the effectiveness of routine comprehensive visual and tactile oral examinations and a definitive diagnosis of OC and OPC made by histopathologic tissue assessment during biopsy.^{5,24}

Although clear guidelines for oral cancer and head and neck examinations have been established for the dental professional, research suggests that barriers exist to prevent practitioners from performing these procedures. A lack of literacy regarding HPV,^{24,25} HPV-related OPC,^{24,25,27} HPV risk factors,^{26,27,28} examination practices,²⁶ anatomy affected,²⁶ and HPV prevention/vaccination^{25,29} are among the most commonly cited barriers. Several studies also determined a deficit in practitioners' communication skills to effectively discuss HPV-related OPC, with the inclusion of risky sexual practices, HPV infection and prevention to be a barrier.^{25,26,29-32} Other studies cite the lack of time to complete an examination,^{28,31,32} and patient's lack of awareness regarding the exam performance and importance,²⁸ to be barriers.

Continuing education (CE) programs have been shown to influence knowledge deficits and impact practitioners' attitudes and practices.^{27,33-38} With regards to HPV-related OPC topics, CE opportunities have been recommended in several studies to impact these professional attributes.^{25,26,30,32} A before and after study conducted by Toftegaard et al.³⁴ concluded an

increase of timely patient oral cancer referrals following CE,³⁴ whereas a systematic review suggested the CE for medical providers to be useful in improving professional practice and patient healthcare outcomes, especially when coupled with multiple learning methods (i.e. interactive format).³⁹ Additional studies have evaluated dentists' and dental hygienists' oral cancer understanding and behavior changes post education intervention, finding statistical differences in tested knowledge following CE.^{27,37,38} Additionally, self-reported communication skills were found to be statistically significant following CE intervention,^{25,33} as were self-reported examination practices.^{33,36,38}

Previous studies suggested a need for HPV-related OPC awareness, particularly in regards to the visual and tactile head and neck examination performance^{25,26,30,31}, however many known barriers have been identified.²⁵⁻³² Research has shown that CE attendance impacts the knowledge and practices of medical and dental professionals.^{27,33-38} A review of the literature shows a lack of recent research regarding the association of continuing education on dental hygiene practitioner's performance. The purpose of this study was to determine the effect of a web-based CE course on dental hygiene practitioners' knowledge, attitudes, and practices (KAP) regarding HPV-related OPC.

Methods

This two-group experimental post-test only design was granted exempt status by the Idaho State University Institutional Review Board (IRB-FY2018-323). To ensure that the experimental and control groups were equal, random selection and random assignment of participants to each group were used. A post-test design approach was chosen to control for pre-test sensitization which can cause individuals to score higher when they take a test for the second time regardless of the intervention.⁴⁰ In this instance, differences between a pre-test and a post-test score may not be a result of the independent variable but rather a result of the testing itself.⁴⁰ Therefore, a post-test design was the most appropriate option for this study and served to strengthen the study's internal and external validity. The lack of a pre-test was not thought to impact the results. The study population consisted of licensed Florida dental hygienists. Email addresses were obtained from the Florida Department of Health website. Inclusion criteria were limited to dental hygienists licensed in the state of Florida, and practicing a minimum of two days per week. A power analysis determined the minimum size needed for this study was 128 participants. A computerized, randomization process performed by Excel® (Microsoft; Bellevue, WA) selected the sample for the study. Once the

individuals consented to participate, they were randomly assigned to either the control or experimental group.

The web-based CE course was developed by the principal investigator, who served as the subject matter expert to design the evidence-based content, based on five years of experience educating entry-level dental hygiene students on this topic. The following principles of instructional design were used: creating a task analysis, developing objectives, planning the lesson and instructional strategies including the case studies, and assessing learning.⁴¹ The components of the instructional design process are shown in Table I. The course content was reviewed by a member of the research team who was a participant in the Lingen et al.⁴ systematic review, and also had 40 years of teaching experience in oral pathology.

The data collection instrument was a self-generated electronic questionnaire consisting of items assessing the dental hygiene practitioners' knowledge, attitudes, and practices related to HPV-related OPC and demographics. Knowledge was assessed through 15 multiple choice questions; attitudes were assessed through 11 statements, using a Likert Scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree); practices were assessed through 13 statements, using a Likert Scale ranging from 1 (0% of the time) to 5 (100% of the time); and demographic questions in a multiple-choice format.

The questionnaire was validated prior to data collection with a content validity index (CVI) consisting of a four-point rating scale: 1 = not relevant, 2 = unable to assess relevance without question revision, 3=relevant but needing slight revision, and 4 = relevant.⁴⁰ Five dental hygiene professionals familiar with HPV-related OPC rated each question. A CVI score was computed for each question by dividing the number of experts rating 3 or 4, divided by five experts. Questions scoring less than .75 were either deleted or rewritten according to rationale and suggestions provided by the panel. Reliability was established by a test-retest completed one week apart by a panel of 12 dental hygiene professionals familiar with clinical practice terms and responsibilities. The reliability coefficient was determined by dividing the number of same question responses by 12. The reliability coefficient was set at .70, and modifications were made to questions scoring less than .70 to improve the final instrument.⁴⁰

An invitation to participate was sent to Florida dental hygienists and included information about the principal investigator, topic of the study, participation expectations, and incentive for study participation. The experimental group participated in a one-hour web-based CE course presented through a videoconferencing platform (Zoom®; San Jose, CA). The course content was case-study based, and included HPV-

OPC epidemiology, risk factors, symptoms, examination practices, diagnosis, and prevention. Six weeks following the CE intervention, both groups received an invitation to participate in the post-test. The link to the questionnaire was sent through an online survey tool (Qualtrics®; Provo, UT). Informed consent information was on the first page of the invitation to participate. Data collection took place over a two-week time frame, and the invitation and survey link were resent twice during this time to increase participation. A \$50 Visa or Amazon gift card drawing was offered as incentive to complete the questionnaire.

The data collected were downloaded without identifier information into an Excel® file, and confidentiality of responses was maintained through Qualtrics®. Data were analyzed using both descriptive statistics and analysis of variance (ANOVA) to test differences between the experimental and control groups. The level of significance was established at $p=0.05$.

Results

A total of 302 dental hygienists licensed in the state of Florida met the inclusion criteria and agreed to participate. However, only 133 participants completed the entire study ($n=133$) yielding a response rate of 44.04%. Participants were randomly assigned to either the experimental ($n=76$) or the control group ($n=78$). However, while 76 individuals began in the experimental group, only 71% ($n=55$) completed the entire survey. Only fully completed surveys were counted in this study. The majority of the participants were between the ages of 36 to 55 years, graduated in the 2000s, and were employed full-time in clinical practice. Demographic information is highlighted in Table II.

Knowledge of HPV in relation to OPC was examined; Table II summarizes the percentage of correct knowledge item responses for both groups. The mean score of the control group was 8.76, equivalent to a 58.4% test score and the mean score of the experimental group was 10.89, equivalent to a 72.6% test score. The difference between the groups was 14.2%, the equivalent of two test items. ANOVA analysis determined a statistically significant difference between the knowledge of experimental group regarding HPV-related OPC as compared to the control group ($p=0.00$, Table III). Cohen's d effect size was 1.05, a large effect size, representing a considerable difference between the groups.

Participants were asked to express their attitudes about HPV-related OPC. Responses comparing the control and experimental group are shown in Table V. The majority of respondents from both groups agreed or strongly agreed that

Table I. HPV related OPC CE Course instructional design process

Instructional objective	CE content	Question
Identify the prevalence, virus strain, transmission, development, appearance, and anatomy affected by HPV-related OPC. (Knowledge, Understanding level)	HPV-related OPC overview through case study: <ul style="list-style-type: none"> • Definition • Prevalence • Strains • Transmission • Anatomy affected • Appearance 	What percentage of oropharyngeal cancers are related to HPV? There are 150 virus strains associated with HPV. Which virus strain is associated with Anita's diagnosis? What areas of the oral cavity are affected by HPV? What was the most likely color of Anita's HPV-related oropharyngeal cancer lesion? From the time of Anita's initial HPV infection, approximately how long did oral cancer development take?
Employ the screening, documentation, and referral procedures utilized for HPV-related OPC. (Knowledge, Applying level)	HPV-related OPC Case study continued: <ul style="list-style-type: none"> • Screening procedures • Documentation procedures • Referral procedures 	Documentation of Anita's oral cancer screening assessment includes recording her? During Anita's oral cancer screening, the dental hygienist would have best visualized the oropharyngeal anatomy by? Due to Anita's diagnosis of HPV-related oropharyngeal cancer, which of her lymph nodes were most likely swollen during the oral cancer screening? When Anita's palpable lymph node and oropharyngeal lesion were identified during the oral cancer screening, what would have been most conservative the next step?
Differentiate between positive and negative HPV-related OPC signs, symptoms, and risk factors. (Knowledge, Evaluating level)	HPV-related OPC case study continued: <ul style="list-style-type: none"> • Signs • Symptoms • Risk factors 	Risk factor(s) associated with HPV-related oropharyngeal cancer include? What are signs and symptoms related to HPV oropharyngeal cancer that Anita could be exhibiting? What age, race, and gender are most commonly associated with HPV-related oropharyngeal cancer?
Create a dental hygiene treatment and outcomes plan to establish a definitive diagnosis regarding HPV-related OPC (Knowledge, Creating level)	HPV-related OPC case study continued: <ul style="list-style-type: none"> • Diagnosis procedures • Treatment • Outcomes 	How was Anita's definitive diagnosis of HPV-related oropharyngeal cancer made? The treatment and outcomes of HPV-related oropharyngeal cancer are most influenced by? Which topic(s) should be addressed when discussing HPV-related oropharyngeal cancer with patients?
Value the need to be proactive about HPV-related OPC. (Attitude, Value level)	Dental Hygienist's role in HPV-related OPC; Case study continued: <ul style="list-style-type: none"> • Assessment procedures • Time involved • Strategies utilized 	It is my responsibility to: <ul style="list-style-type: none"> • Collect a thorough health history with the inclusion of a sexual history on all patients. • Identify risk factors on the health history associated with HPV-related oropharyngeal cancer. • Examine all patients for oral cancer. I need to: <ul style="list-style-type: none"> • Visualize the oropharyngeal area during an oral cancer examination. • Palpate the cervical lymph nodes during an oral cancer examination. • Teach my patients about the risky sexual practices associated with HPV-related oropharyngeal cancer. • Follow up with patients who have had a positive oral cancer examination • My patients deserve the highest quality of care I can provide. • It is my employer's responsibility to set the standard for my dental hygiene clinical care. • Continuing education is valuable to maintain current skills and practices.
Display a commitment to their role as prevention specialists in HPV-related OPC. (Attitude, Organizational level)		At each appointment, I review the patient health history with the inclusion of identifying HPV-related OPC risk factors. During every new patient appointment, I perform an: <ul style="list-style-type: none"> • <u>Extra</u>-oral examination. • <u>Intra</u>-oral examination. During each recare patient appointment, I perform an: <ul style="list-style-type: none"> • <u>Extra</u>-oral examination. • <u>Intra</u>-oral examination.
Incorporate HPV-related OPC early diagnosis and prevention into the provision of oral care for every patient. (Practice, Characterization level)		I perform an: <ul style="list-style-type: none"> • <u>Extra</u>-oral examination that includes palpation of the cervical lymph nodes. • <u>Intra</u>-oral examination that includes viewing the base of the tongue. • <u>Intra</u>-oral examination that includes viewing the tonsils and middle part of the throat. I inform patients when I am performing an oral cancer screening. I discuss HPV-related OPC risk factors, including risky sexual practices with: <ul style="list-style-type: none"> • Adolescent (ages 12-17) patients. • Adult (ages 18-64) patients. • Geriatric (ages 65 and older) patients. • All of my patients.

Table II. Respondent demographics

	n = 133	%*
Age		
25 or below	2	1.50
26-35	24	18.1
36-45	37	27.8
46-55	35	26.3
>55	35	26.3
Dental Hygiene School Graduation Year		
Before 1970	1	0.80
1970-1979	14	10.5
1980-1989	26	19.5
1990-1999	20	15.0
2000-2009	33	24.8
2010-2018	39	29.3
Years Practicing		
1-5 years	33	24.8
6-10 years	13	9.80
11-20 years	29	21.8
21- 30 years	24	18.0
31-40 years	24	18.0
More than 40 years	10	7.50
Hours Practicing Per Week		
Full-Time (35 or more hours per week)	82	61.7
Part-Time (less than 35 hours per week, but at least two days per week)	49	38.6
Less than 2 days a week	2	1.5
Practice Type		
Public Health	9	6.80
Education	9	6.80
Clinical Practice	99	74.4
Corporate	11	8.30
Missing	5	3.8

*Percentages may not equal 100 due to rounding of numbers

Table III. Correct responses to HPV-related OPC knowledge questions* (%)

Knowledge Item	Control Group	Experimental Group
1. What percentage of oropharyngeal cancers are related to HPV? A. 35% B. 55% C. 75% D. 95%	46.2%	52.7%
2. There are 150 virus strains associated with HPV. Which strain is most likely associated with Anita's diagnosis? A. 16 B. 18 C. 24 D. 52	57.7%	80.0%
3. Risk factors associated with HPV-related OPC include: A. Tobacco and alcohol use B. Sexual debut at a younger age, and multiple partners C. History of cervical cancer D. Genital warts and other sexually transmitted diseases	60.3%	69.1%
4. What areas of the oral cavity are affected by HPV-related OPC? A. Middle part of the throat, soft palate, uvula, base of the tongue, and tonsils B. Tonsils, sides of the tongue, floor of the mouth, and buccal mucosa C. Buccal mucosa, base of the tongue, hard palate, and labial mucosa D. Ventral surface of the tongue, middle part of the throat, sides of the tongue, and uvula	71.8%	89.1%
5. Documentation of Anita's oral cancer examination includes recording which of the following? A. Palpable lymph node location B. Lesion size and color C. Location of the lesion D. All of the above	92.3%	98.2%
6. Due to Anita's diagnosis of HPV-related OPC, which of her lymph nodes were most likely swollen during the oral cancer examination? A. Pre and post auricular B. Submandibular C. Cervical D. Supraclavicular	20.5%	40.0%

Table III. Correct responses to HPV-related OPC knowledge questions* (%) continued

Knowledge Item	Control Group	Experimental Group	Knowledge Item	Control Group	Experimental Group
7. During Anita's oral cancer examination, the dental hygienist would have best visualized the oropharyngeal anatomy by: A. Laying the patient back (supine), and using gauze to retract the tongue and view the oropharynx B. Seating the patient upright, and using a mirror and light view the oropharynx C. Using a high definition mirror and asking the patient to swallow D. Positioning of the patient does not matter	16.7%	74.5%	12. When Anita's palpable lymph node and oropharyngeal lesion were identified during the oral cancer examination, what would have been the most conservative next step? A. Show the patient the areas of concern, and tell them to keep an eye on them B. Schedule her to come back in two weeks to re-evaluate the areas C. Performance of an adjunctive screening device such as VELscope®, ViziLite Plus®, or toluidine blue D. Examination by the dentist with referral to the oral surgeon	38.5%	43.6%
8. What was the most likely color of Anita's HPV-related OPC? A. Red B. White C. Either red or white D. Pink healthy color	47.4%	65.6%	13. How was Anita's definitive diagnosis of HPV-related OPC made? A. Adjunctive screening devices such as VELscope®, ViziLite Plus®, or toluidine blue B. Visual inspection of the oropharyngeal anatomy C. Palpation of the cervical lymph nodes D. Histopathic assessment of tissue obtained during biopsy	84.6%	80.0%
9. From the time of Anita's initial HPV infection, approximately how long did oral cancer development take? A. Days B. Weeks C. Months D. Years	60.3%	58.2%	14. The treatment and outcomes of HPV-related OPC are MOST influenced by the: A. Age and gender of the patient B. Early detection of a lesion C. Patient's immune system D. Lesion size and color	96.2%	98.2%
10. What are signs and symptoms related to HPV OPC that Anita could be exhibiting? A. Sore throat and bleeding gingiva B. Chronic trouble swallowing and ear pain C. Tongue swelling and loss of taste D. Dry mouth and pain with swallowing	59.0%	78.2%	15. Which topics should be addressed when discussing HPV-related OPC with patients? A. Risky sexual behaviors B. Being vaccinated C. Cancer signs and symptoms D. All of the above	96.2%	96.3%
11. What age, race and gender are most commonly associated with HPV-related OPC? A. Middle aged white females B. Younger white males C. Middle aged African-American females D. Older African-American males	35.9%	70.9%			

Table IV. ANOVA summary

Source of the Variance		SS*	Df*	MS*	F*	Sig.*
Knowledge	Between Groups	140.468	1	140.468	33.841	0.000
Attitudes	Between Groups	242.550	1	242.550	13.914	0.000
Oral Examination Practices	Between Groups	10.171	1	10.171	0.177	0.674
HPV Specific Practices	Between Groups	192.887	1	192.887	7.478	0.007

*SS-Sum of Squares; df-Degrees of Freedom; MS-Mean Squares; F-F Ratio of the MS between to the MS ($p < .001$); Sig.- Significance

it is their responsibility to identify risk factors on the health history associated with HPV-related OPC (94.6% experimental group, 93.5% control group); to examine all patients for oral cancer (100% experimental group, 98.7% control group); and to visualize the oropharyngeal area during an oral cancer examination (98.1% experimental group, 100% control group). Additionally, participants in both groups valued patients deserving high quality of care (100% both groups) and continuing education to maintain current skills and practices (100% both groups). However, there were differences in attitudes demonstrated by both groups related to the collection of a thorough health history including a sexual history inquiry on all patients; responsibility to teach patients about high risk sexual practices associated with HPV-related OPC; and, employer's responsibility to set the standard for dental hygiene clinical care (responses varied across each of the scales). ANOVA analysis revealed a statistically significant difference between the experimental and control groups' attitudes regarding HPV-OPC ($p = 0.00$). A summary of the ANOVA of the participants knowledge, attitudes, and practices is shown in Table IV. Cohen's d effect was 0.66, a medium effect size, representing a moderate difference between the groups.

Respondents reported on the frequency of their practices related to oral examinations and any HPV specific procedures. More than half of the respondents indicated that they conducted an extra-oral examination on new patients at least 75% of the time or more (experimental group 65.5%, control group 62.8%) and for re-care patients (experimental group 56.4%, control group 59%). In comparison, the vast majority of respondents reported completing an intra-oral examination on new and re-care patients (experimental group 92.7% control group 92%) more frequently than an extra-oral exam (experimental group 93.3%, control group 85.9%). ANOVA analysis showed no statistically significant difference between the groups on oral examination practices ($p = 0.67$). Dental hygienists' practice behaviors related to extra- and intraoral examinations and HPV specific procedures are shown in Table VI.

The ANOVA results comparing the experimental and control groups related to HPV specific practices identified a statistically significant difference ($p = 0.007$) in this area. Cohen's d effect size was 0.48 for these practice items, representing a small effect size, but nearly a medium effect size (.50), indicating a small to moderate difference between the groups. The results also demonstrated that the majority of participants

were not holding discussions with their patients about HPV risk factors, regardless of the patient's age and nearly to 50% of the time, participants were not discussing HPV vaccinations (experimental group 83.6%, control group 93.6%).

Discussion

The one-hour web-based CE course on HPV-related OPC in this study was shown to be an effective method for increasing knowledge, attitudes and HPV specific practices, however it was not shown to be effective in changing oral examination practices in the population studied. Knowledge was measured by correct responses to multiple-choice questions as an objective evaluation; whereas, attitudes and practices relied on self-reported measurements. Although the experimental group had higher scores on the knowledge items than the control group, the average score was still low, thus indicating the need for ongoing education on this topic. Participants were not aware of the significant relationships between HPV to OPC and risk factors commonly associated with HPV-related OPC. This finding is consistent with the lack of knowledge about oral cancer among dentists and physicians when measured by an objective evaluation.²⁷

The knowledge portion of this study showed that many dental hygienists were not fully informed of the extra-oral anatomy associated with HPV-related OPC, recognition of lymph node involvement, best visualization of oropharyngeal anatomy, signs and symptoms, and re-evaluation procedures based on presenting signs and symptoms. These findings conflict with a previous study's results where the majority of dental hygiene participants self-rated their knowledge and skills regarding examination practices to be very

Table V. Dental hygienists' attitudes regarding HPV related OPC*

Attitude Item (n=133)	Strongly Agree		Agree		Neutral		Disagree		Strongly Disagree	
	C**	E***	C	E	C	E	C	E	C	E
1. It is my responsibility to collect a thorough health history with the inclusion of a sexual history on all patients.	23.1	45.5	24.4	36.4	23.1	10.9	24.4	7.3	5.1	0.0
2. It is my responsibility to identify risk factors on the health history associated with HPV-related OPC.	53.8	67.3	39.7	27.3	5.1	5.5	1.3	0.0	0.0	0.0
3. It is my responsibility to examine all patients for oral cancer.	85.9	90.9	12.8	9.1	1.3	0.0	0.0	0.0	0.0	0.0
4. I need to visualize the oropharyngeal area during an oral cancer examination.	79.5	94.5	20.5	3.6	0.0	1.8	0.0	0.0	0.0	0.0
5. I need to palpate the lymph nodes in the head and neck region during an oral cancer examination.	76.9	81.1	20.5	18.2	2.6	0.0	0.0	0.0	0.0	0.0
6. It is my responsibility to communicate with all patients about HPV prevention, including vaccination.	34.6	52.7	28.2	36.4	26.9	10.9	9.0	0.0	1.3	0.0
7. It is NOT my responsibility to teach my patients about the risky sexual practices associated with HPV-related OPC.	9.0	1.8	17.9	10.9	32.1	16.4	28.2	47.3	12.8	23.6
8. It is NOT my responsibility to follow up with patients who have had a positive oral cancer examination.	3.8	1.8	2.6	0.0	12.8	1.8	32.1	21.8	48.7	74.5
9. My patients deserve the highest quality of care I can provide.	89.7	98.2	10.3	1.8	0.0	0.0	0.0	0.0	0.0	0.0
10. It is my employer's responsibility to set the standard for my dental hygiene clinical care.	9.0	16.4	11.5	5.5	11.5	18.2	38.5	38.2	29.5	21.8
11. Continuing education is valuable to maintain current skills and practices.	93.6	90.9	6.4	9.1	0.0	0.0	0.0	0.0	0.0	0.0

*Results reported in percentages; percentages may not equal 100 due to rounding;

C: Control Group; *E: Experimental Group

good and regarded themselves as being highly knowledgeable about oral cancer examination practices.²⁸ Dental hygienists' knowledge might be more accurately measured through an objective evaluation compared to self-rated assessments.

The vast majority of respondents from this study, (98-100%) shared the attitude that oral cancer examinations should be conducted on all patients. Similar results were reported by Tax et al.²⁸ where examination procedures were perceived to be an important part of the dental hygienist's scope of practice. Forrest et al.⁴² further confirmed this finding where all respondents believed that oral cancer examinations should be performed on adult patients aged 40 years and older. Likewise, Marino et al.²⁶ found 95.2% of the respondents agreed that these examinations should be routinely performed. This study of Florida dental hygienists concurs with previous findings demonstrating a continued

trend in practitioner oral examination attitudes, while mixed practices correlating to this belief, have been documented.

Although overall examination practices were high, fewer respondents indicated that they were palpating the cervical lymph nodes as part of an extraoral examination, and only about two thirds of the respondents examined the tonsils and middle part of the throat as well as the base of the tongue. These anatomical structures are directly related to HPV OPC and regular examination of these structures is essential for early cancer diagnosis. Equally relevant, not all practitioners informed patients they were conducting an oral cancer examination. This particular finding supports other studies in which patients reported they were not told that an oral cancer examination was being performed by their oral health provider,⁴³ and dentists indicated that they did not always tell their patients that they had completed an oral cancer

Table VI. Dental hygienists' practices related to oral examination and HPV specific practices*

Oral Examination Practices										
Item	0% of the time		At least 25% of the time		At least 50% of the time		At least 75% of the time		100% of the time	
	C**	E***	C	E	C	E	C	E	C	E
1. During every new patient appointment, I perform an extra-oral examination. (n=133)	23.1	18.2	10.3	12.7	3.8	3.6	12.8	16.4	50.0	49.1
2. During every new patient appointment, I perform an intra-oral examination. (N=133)	3.8	5.5	1.3	1.5	2.6	0.0	9.0	3.6	83.3	89.1
3. During each recall patient appointment, I perform an extra-oral examination. (n=133)	19.2	21.8	11.5	10.9	10.3	10.9	12.8	20.0	46.2	36.4
4. During each recall appointment, I perform an intra-oral examination. (n=133)	2.6	1.8	3.8	1.8	7.7	3.6	14.1	14.8	71.8	78.2
5. I perform an extra-oral examination that includes palpation of the cervical lymph nodes. (n=133)	35.9	23.6	6.4	12.7	12.8	9.1	11.8	21.8	33.3	32.7
6. I perform an intra-oral examination that includes viewing the base of the tongue. (n=133)	5.1	1.8	3.8	5.5	10.3	9.1	14.1	14.5	66.7	69.1
7. I perform an intra-oral examination that includes viewing the tonsils and middle part of the throat. (n=133)	5.1	3.6	7.7	1.8	12.8	9.1	14.1	21.8	60.3	63.3
8. I inform patients when I am performing an oral cancer examination. (n=133)	9.0	7.3	5.1	10.9	5.1	10.9	11.5	5.5	69.2	65.5
HPV Specific Practices										
Item	0% of the time		At least 25% of the time		At least 50% of the time		At least 75% of the time		100% of the time	
	C	E	C	E	C	E	C	E	C	E
9. At each appointment, I review the patient health history with the inclusion of identifying HPV-related OPC risk factors. (n=133)	24.4	10.9	20.5	12.7	11.5	20.0	12.8	36.4	30.8	20.0
10. I discuss HPV-related oropharyngeal risk factors, including sexual practices, with adolescent (ages 12-17) patients. (n=132)	65.4	56.4	11.5	7.3	10.3	16.4	5.1	10.9	6.4	9.1
11. I discuss HPV-related oropharyngeal risk factors, including sexual practices, with adult (ages 18-64) patients. (n=132)	57.7	34.5	20.5	12.7	11.5	34.5	3.8	7.3	5.1	10.9
12. I discuss HPV-related oropharyngeal risk factors, including sexual practices, with geriatric (ages 65 and older) patients. (n=132)	69.2	56.4	15.4	14.5	6.4	16.4	3.8	7.3	3.8	5.5
13. I discuss HPV vaccination with all of my patients. (n=133)	70.5	38.2	15.4	21.8	7.7	23.6	2.6	10.9	3.8	5.5

*Results reported in percentages; percentages may not equal 100 due to rounding;

C: Control Group; *E: Experimental Group

examination.³³ Dental hygienists play a vital role in increasing patients' awareness of oral examinations, and in turn, may increase patients' expectations and perceptions of the value of this procedure. Standards of practice dictate that oral health professionals should perform a comprehensive visual and tactile oral examination on all patients at every appointment.⁴

Practices specific to HPV were separated out and more closely examined where significant differences were found between the groups. A notable finding of this study was that although many participants agreed/strongly agreed that it was their responsibility to conduct a thorough health history, including a sexual history on all patients, the practice component of the survey showed that many were less inclined to have discussions about HPV-OPC risk factors and sexual practices with patients depending on the patient's age. This same finding held true in regards to attitudes and practices related to discussing HPV vaccinations with all patients. Similar results were reported by Thompson et al.²⁵ in their study of communication with regards to HPV disease transmission, HPV related cancers and vaccination information among dental hygienists. Kline et al.⁴⁴ likewise described the significant role of dental practitioners in HPV-OPC prevention, but also identified barriers specific to HPV discussions, including fear of offending patients, and lack of privacy and time. Similarly, a systematic review conducted by Walker et al.⁴⁵ identified practitioners to be less likely to recommend or discuss HPV vaccination if they were uncomfortable discussing sexual practices. Rising rates of HPV-related OPC necessitate developing strategies to overcome oral health practitioners discomfort addressing sexual history and HPV vaccination.

While this study found significant statistical differences between the control and experimental groups regarding knowledge, attitudes, and HPV-related practices, there appears to be a disconnect between respondents' attitudes and actual practices. Investigation into the levels of the affective domain of learning may afford a better understanding of how attitudes are translated to practice. In the affective domain, attitudes are represented by the value one places on something.⁴⁶ Practice, a higher level of development known as characterizing, is achieved when attitudes are accepted and acted upon.⁴⁷ Further examination of the affective domain levels in relation to dental hygienists' attitudes and practices may be used to enhance future education on the topic of HPV-related OPC.

When considering the American Dental Hygienists' Association (ADHA) Code of Ethics, dental hygiene

professionals have a responsibility "to provide oral health care utilizing high levels of professional knowledge, judgement, and skill."⁴⁷ Additionally, the dental hygienist is accountable for upholding the ADHA Standards for Clinical Dental Hygiene Practice which includes comprehensive extra- and intraoral examination practices and patient care.⁴⁸ The dental hygiene profession must be part of a health care team that is proactive about prevention and early detection of disease. Continuing education is one method of increasing practitioner knowledge; however, alternate methods of ongoing professional development and self-enhancement should be investigated regularly.

Multiple resources are available for patient assessment and examination procedures specifically related to oral pathologies including those provided by the American Dental Association.^{21,49} Additionally, the Centers for Disease Control and Prevention have numerous resources on the topics of HPV,⁵⁰ HPV risk factors,⁵¹ vaccination⁵² and how to take a sexual history.⁵³ Dental hygienists have also expressed interest in participating in continuing education programs related to these topics.²⁵ Courses could be more effective in changing behaviors by incorporating more interactive strategies³⁹ and opportunities requiring audience participation, such as those supported by Phillips et al.⁵⁴ for active online CE learning and those by Griscti et al.⁵⁵ on the effectiveness of CE programs.

Following the CE webinar for this study, the experimental group participants requested a video on the extra and intraoral examination. Interest was also expressed for guidance on conducting a sexual history, and how to discuss the HPV vaccine. A web-based CE could be enhanced by including an online module with the recorded CE course featuring permanent links to resources associated with course content. This platform aligns with the principles of adult learning which include self-directed, facilitated guidance with the inclusion of videos, resources, and technology.⁴¹

This study had limitations. The questionnaire used was an original design, however efforts were made to balance this limitation by establishing content validity and reliability. Participants may have provided inaccurate favorable responses to some of the survey items due to self-perceived obligations related to job performance. In addition, the six-week length of time between the CE course and post-test, and the small population size may limit the breadth of data received. There was a loss of participants from the experimental group from the beginning of the study to completion of the survey, although no pattern was identified among the incomplete surveys. Explanations for this loss in numbers might be attributed to the difficulty of the survey, time commitment

of the respondents, or the better retainment of information by those completing the survey. It should be noted, however, that the study design included a randomization procedure to identify the sample, and random assignment was further used to select control and experimental groups.

Additional research in the area of HPV-related OPC and dental hygiene knowledge, attitudes and practice is recommended. Identifying what types of interventions are shown to increase knowledge about HPV-related OPC is important as HPV-related OPC rates continue to rise. Dental hygienists are ideally positioned to be part of the health care team that are effective in prevention, treatment and outcomes of this disease. Determining the drivers for practice change is needed, as knowledge does not necessarily translate to practice. Identifying how dental hygienists can address sensitive topics such as HPV risk factors and sexual practices, how to take a sexual history from individuals spanning all ages, and providing vaccination recommendations, requires further attention from both a qualitative and a quantitative research perspective.

Conclusion:

This study explored the impact a continuing education course on HPV-related OPC epidemiology, risk factors, symptoms, examination procedures, diagnosis, and prevention in regards to dental hygienists' knowledge, attitudes and practices concerning HPV-related OPCs. Results from this study identified statistically significant differences between the the experimental and control groups in the areas of knowledge and attitudes. While no differences were found between the groups in relationship to examination procedures; statistically significant differences were noted for items related to HPV specific practices. Additional research is needed to appreciate what specific types of professional development interventions, such as access to resources, interactive discussion formats, and coordinated hands-on activities, would increase the HPV-related OPC knowledge and practice behaviors of dental hygienists.

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