

## Examining the Role of HPV Communication Training in the Knowledge, Attitudes, Comfort, and Confidence of Dental Hygiene Students

Cyndee L. Stull, DHSc, MDH, RDH; Eric Matthews, PhD, RT(R) (CV) (MR), EMT;  
Michael Evans, MS; Michelle C. Arnett, MS, RDH

### Abstract

**Purpose:** Human papillomavirus-positive oropharyngeal cancer (HPV-OPC) is the most common HPV-associated cancer. The purpose of this study was to explore the role of a curriculum that utilized brief motivational interviewing (BMI) strategies on the knowledge, attitudes, comfort, and confidence of dental hygiene students regarding communication about HPV.

**Methods:** Junior and senior dental hygiene (DH) and dental therapy (DT) students participated in this retrospective study. Senior students (n=26) were assigned to the control group while junior students (n=31) were assigned to the intervention group. Both groups completed an online HPV education module. The intervention group was trained in BMI techniques for communication on HPV while the control group did not receive any additional guidance. Both groups were required to have HPV discussions with two patients. Pre-test/post-test questionnaires were administered via an online software program for each patient encounter. Descriptive statistics were used to analyze the data.

**Results:** Thirty-one intervention group and 26 control group participants completed the pre- and post-test quizzes and questionnaires. While knowledge improved for both groups from pre-test to post-test one (+5.3 % correct,  $p=0.001$ ) and post-test two (+3.2,  $p=0.04$ ) it was not statistically significant. Attitude scores were higher in the control group at post-test one (3.25 vs 3.01,  $p=0.07$ ) and post-test two (3.14 vs 2.91,  $p=0.05$ ). Confidence was higher in the control group at post-test one (3.16 vs 2.82,  $p=0.05$ ) and post-test two (3.21 vs 2.69,  $p=0.006$ ). Comfort was higher in the control group at post-test one (3.16 vs 2.56,  $p=0.002$ ) but not at post-test two (2.65 vs 2.83,  $p=0.45$ ).

**Conclusion:** Results from this study suggest that dental hygiene education programs should include didactic instruction on HPV, the use of BMI strategies, as well as multiple opportunities to practice HPV related conversations to improve student knowledge, attitudes, comfort, and confidence levels. Interactive continuing education programs with a focus on HPV and BMI techniques can also assist oral health care providers in the delivery of provider-patient communication on HPV.

**Keywords:** human papillomavirus, sexually transmitted infections, HPV vaccine, communication skills, brief motivational interviewing, dental hygiene education

This manuscript supports the NDHRA priority area, **Professional development: Education** (evaluation).

Submitted for publication:10/25/20; accepted:1/5/21

### Introduction

Human papillomavirus (HPV) is the most common sexually transmitted disease and is responsible for most cervical, anal, and oropharyngeal cancers.<sup>1,2</sup> Human papillomavirus infections are asymptomatic and although the immune system clears 80% of HPV infections within a year, persistent infections can progress to cancer after many years.<sup>1,3</sup> Unlike cervical cancer, early detection and screening

for human papillomavirus-positive oropharyngeal cancer (HPV-OPC) is difficult, owing to the lack of a presenting lesion and limited visibility at the base of the tongue, soft palate, and tonsillar crypts.<sup>1</sup> Consequently, HPV-OPC is now the most common HPV-associated cancer.<sup>4</sup>

Although a safe, effective prophylactic vaccine against oncogenic HPV types has been available and recommended

for adolescents since 2006, uptake of the vaccine in the United States (US) has been slow.<sup>2,5,6</sup> Data show a 48.6% vaccine completion rate for adolescents ages 13-17, falling short of the national goal of 80%.<sup>2,7</sup> Additionally, catch-up vaccines are available up to age 45 to extend protection against infection for at-risk older age groups.<sup>8</sup>

Recommendations by health care providers have shown to be the most influential factor in vaccine uptake, yet providers report a lack in the skills, comfort, and confidence in HPV communication.<sup>9,10</sup> Effective patient-provider communication can be difficult without provider training.<sup>9,11,12</sup> Malo et al. found that providers' attitudes, subjective norms, and perceived self-efficacy improved post-training, facilitating improved provider HPV communication.<sup>11</sup>

Dental providers understand the important role they play in the reduction of HPV-OPC.<sup>13</sup> Prevention efforts by primary dental providers have historically focused on secondary and tertiary prevention through screening and referrals. Recently, policy statements issued by the American Dental Association (ADA) and American Academy of Pediatric Dentistry (AAPD) encourage dental providers to expand their HPV prevention efforts to include primary prevention activities, such as patient education and immunization advocacy.<sup>14,15</sup> However, research has shown that few dental providers discuss the role of HPV in oropharyngeal cancer or provide vaccine counseling for patients.<sup>2,16,17,18</sup> Dental providers have reported several barriers to HPV communication, including discomfort in discussing a sensitive topic and a lack of knowledge, training, and confidence.<sup>2,5,16,17,18</sup> Conversely, parents of adolescents have reported comfort in having HPV discussions with their dental provider, given the role of HPV in oropharyngeal cancer.<sup>19</sup> This finding may encourage comfort and confidence among dental providers in having HPV discussions with patients. Although some dentists and dental hygienists have reported receiving HPV information during their formal education, the information had little practical value.<sup>13,18</sup> Focused training in HPV communication strategies is rare. A survey of dental hygiene program directors found that the majority of programs spend less than two hours on HPV didactic content, with few programs (14.4%) assessing students' HPV communication skills during patient encounters.<sup>20</sup> However, dental providers are trained in collaborative patient-centered communication strategies aimed at behavior change which also may be helpful in HPV counseling.

Motivational interviewing (MI) is a collaborative, patient-centered counseling approach to support intrinsic motivation.<sup>21</sup> Training in MI has been found effective in improving the knowledge, skills, comfort, and confidence of

providers during difficult conversations with patients related to various health conditions including weight management, tobacco cessation, chemical dependency, and oral health.<sup>22,23,24</sup> Motivational interviewing has been shown to be effective in facilitating HPV conversations and increasing HPV and non-HPV vaccine uptake in medical settings.<sup>10</sup> Given the HPV patient-provider communication barriers cited in the literature, MI stands out as an evidence-based counseling approach for dental providers during HPV-OPC and HPV vaccine uptake conversations.<sup>2,5,16,17,18</sup>

One challenge with the inclusion of MI in the dental setting is limited time.<sup>24,25,26</sup> However, brief motivational interviewing (BMI) is intended for providers with limited time of 5-15 minutes and is designed to collaborate with patients to assess motives, raise awareness, and support change.<sup>27</sup> Dental professionals often have less than 15 minutes during a patient care visit to discuss behaviors that contribute to oral diseases, such as HPV.<sup>27,26,27</sup> Reno et al. reported providers who used BMI perceived it as more effective than other communication strategies to address vaccine hesitancy.<sup>10</sup> More importantly, providers reported BMI compelled them to practice active listening thus empowering parents in shared decision-making.<sup>10</sup> Brief motivational interviewing may be a useful communication strategy for assessing patient motivations for prevention of HPV-OPC, raising HPV vaccine awareness, and supporting change in high-risk behaviors associated with HPV-OPC.

Motivational interviewing has been a key component of the dental hygiene patient communication curriculum for the past decade.<sup>26,28,29</sup> Dental hygiene students educated in MI counseling are familiar with its principles and guiding strategies that are applicable when discussing sensitive topics including HPV transmission, HPV-OPC, and vaccine uptake. An HPV communication training intervention may reduce barriers and influence dental hygiene students' comfort and self-efficacy in HPV prevention. Limited research has shown that brief educational interventions may improve the knowledge, comfort, and confidence in HPV counseling for oral health care providers,<sup>12,30</sup> however there is a gap in the literature regarding the role of an experiential HPV communication training program on oral health care providers' ability and confidence in executing HPV conversations with patients. In response to this need, the University of Minnesota (UMN) Division of Dental Hygiene implemented an updated HPV curriculum for dental hygiene (DH) and dual degree dental hygiene/dental therapy students (DT) that included an experiential BMI component. The purpose of this retrospective study was to explore the role of an experiential HPV BMI training curriculum on the

knowledge, comfort, confidence, and performance of DH and DT students in HPV communication and vaccine advocacy.

## Methods

This study was approved by the UMN Institutional Review Board (STUDY00007617). A retrospective pre-test/post-test with intervention and control groups was used to assess an enhanced HPV BMI training curriculum in the UMN Division of Dental Hygiene program. The theory of planned behavior provided the framework for integrating the HPV curriculum into the bachelor's degree program to improve students' confidence regarding HPV communication. This theory posits that the adoption of a behavior is influenced by a person's attitude toward the behavior, the perception of subjective norms regarding the behavior, and the person's confidence (self-efficacy) in performing the behavior.<sup>31</sup>

University of Minnesota dental hygiene student cohorts are comprised of DH and DH/DT dual degree students; both student groups complete the entire dental hygiene curriculum. The intervention group was comprised of junior students (DH3, DT3); senior students (DH4, DT4) served as the control group. All HPV and BMI content quizzes and questionnaires were course requirements. The UMN IRB did not require consent to participate due to details of the enhanced HPV BMI training curriculum provided in the course syllabus. Both groups completed an online 40-minute HPV communication training module. Content included general HPV information, the role of HPV in OPC, and HPV vaccination facts. In addition, the intervention group completed a 90-minute, face to face, role-playing session using BMI techniques for HPV communication strategies. Peer and faculty feedback were given during and immediately following the role-play session. Both groups were required to have HPV discussions with two patients and were provided with HPV fact sheets to facilitate patient conversations.

The intervention group demonstrated their BMI communication training during two audio-recorded HPV patient conversation assignments in the UMN School of Dentistry (SoD) clinics as part of the clinical applications course (semester 3). Students used BMI communication skills to assess adult patients' knowledge of general HPV information, the role of HPV in OPC, and readiness to discuss HPV vaccination with their physician and later listened to their two audio-recorded patient interactions and self-assessed. Faculty feedback was also provided after each patient interaction.

Students in the control group completed two required patient HPV interactions as part of their clinical applications

course (semester 6). No faculty feedback was given to these students on their HPV patient interactions. The control group had previously completed MI and BMI training within the UMN curriculum, and their MI strategies had been evaluated previously during three Objective Structured Clinical Examinations (semesters 3,4,5).

Prior to completing the online HPV communication training module, both groups completed a quiz on their HPV knowledge and a questionnaire assessing attitudes, comfort, and confidence in HPV communication (pre-test one). The intervention group completed the same quiz and questionnaire immediately following the training module (post-test one) and again following two patient interactions (post-test two). Whereas, the control group completed the same quiz following two patient interactions only. Additionally, the intervention group completed a second questionnaire specifically addressing confidence and comfort in using BMI for conversations regarding HPV immediately following the role-playing session and following two patient interactions.

## Instruments

Demographic information collected included age, gender, race, and highest level of education. A 50-item True/False, faculty created quiz was used to assess students' HPV knowledge prior to and following the online HPV course. A previously used attitude, comfort and confidence questionnaire that assessed the knowledge attitudes, and practices of HPV communication and vaccine advocacy among Minnesota dentists and dental hygienists was used with permission from Stull and Lunos.<sup>17</sup> Modifications were made to assess attitudes of DH and DT students regarding HPV communication with patients. The questionnaire included seventeen Likert-type items on a four-point scale.

A second series of three instruments was used to assess the intervention group regarding the use of BMI to enhance comfort and confidence for HPV communication. A total of three previously used questionnaires from the University of Missouri-Kansas City and the University of Michigan were modified with permission to include HPV and HPV vaccine content assessing the comfort and confidence in using BMI for patient communication.<sup>24</sup> The HPV BMI pre-test instrument was administered immediately prior to the BMI training and included 24 Likert-type items on a six-point scale. Two additional questionnaires were delivered. Post-test one was delivered immediately after the BMI role-playing and post-test two was delivered following the completion of two patient encounters. Post-test one and post-test two each consisted of 30 items. The knowledge quiz and questionnaires

were pilot-tested by six dental hygiene faculty members to establish face and content validity; minor modifications were made to improve clarity.

### ***Knowledge, attitude, confidence, and comfort calculations***

Participants took a 50-item knowledge quiz at three separate timepoints. Knowledge scores in the control and intervention groups for pre-test quiz (before 40-minute online educational module), post-test quiz one (immediately following HPV education module), and post-test quiz two (after two patient interactions) were calculated as the percentage of correct answers on the knowledge quiz.

Attitude scores at each time point were calculated as the mean of the 17 items (4-point Likert scale) on the attitude questionnaire (with two items of opposite valence reverse-coded prior to averaging) such that a higher attitude score represents a more favorable attitude. Confidence and comfort scores were calculated similarly at each time point, using a subset of three attitude items pertaining to confidence and one attitude item pertaining to comfort, such that higher scores correspond to greater confidence and comfort.

Separate BMI confidence and BMI comfort scores were calculated in the intervention group only, using responses (6-point Likert scale) to the BMI instrument. Brief motivational interviewing confidence at each time point was calculated as the mean of the four confidence-related questions, and BMI comfort at the post-test one and two time points was calculated as the mean of two comfort-related questions, with higher scores representing greater confidence and comfort. A survey software program (Qualtrics; Provo, UT, USA) was used for data collection.

### ***Statistical analysis***

Knowledge, attitude, confidence, and comfort scores were compared between control and intervention groups at each time point using two-sample *t*-tests. Scores were compared within groups between the pre-test and post-tests one and two time points using linear models. Demographic characteristics were compared between groups using Fisher's exact tests. Scores are summarized as mean  $\pm$  standard deviation, and categorical characteristics are summarized using rates. Analyses were conducted using statistical software (R version

3.6.1, R Foundation for Statistical Computing; Vienna, AT). A two-sided *p*-value less than 0.05 was regarded as statistically significant.

## **Results**

All students in the intervention group ( $n=31$ ) completed six instruments administered at three different time points. All students from the control group ( $n=26$ ) completed the 50-item quiz and the three questionnaires administered at three different time points. Education level differed between groups ( $p=0.008$ ), with higher levels of education in the control group. Demographics are shown in Table I.

**Table I. Participant demographics ( $n=57$ )**

Characteristic	DH3/DT3 ( $n=31$ )	DH4/DT4 ( $n=26$ )	<i>p</i> -value
	<b>n (%)</b>	<b>n (%)</b>	
<b>Age</b>			<b>0.78</b>
19-22	18 (58.0)	12 (46.0)	
23-26	8 (26.0)	7 (27.0)	
27+	3 (10.0)	3 (12.0)	
Age not given	2 (6.0)	4 (15.0)	
<b>Gender</b>			<b>0.04</b>
Female	31 (100.0)	22 (85.0)	
Male	—	4 (15.0)	
<b>Race</b>			<b>0.19</b>
Hispanic /Latino	2 (6.0)	4 (15.0)	
Black/African-American	3 (10.0)	4 (15.0)	
Native American/Alaskan Native	—	1 (4.0)	
Asian	7 (23.0)	2 (8.0)	
White	19 (61.0)	13 (50.0)	
Missing	—	2 (8.0)	
<b>Education</b>			<b>0.008</b>
Some college, no degree	19 (61.0)	6 (23.0)	
Associate degree	2 (6.0)	2 (8.0)	
Bachelor degree	10 (32.0)	17 (65.0)	
Graduate degree	—	1 (4.0)	

Mean knowledge scores for both cohorts improved from pre-test to post-test two. The control group mean knowledge scores (pre-test  $81.7\pm6.1$ ; post-test one  $87.4\pm4.2$ ; post-test two  $84.3\pm6.8$ ) tended to be higher than the intervention group scores across all time points, although not statistically significant. Knowledge, attitudes, confidence, and comfort scores between cohorts at three time points is shown in Table II.

Difference in mean pre-test attitude scores between control ( $3.01\pm0.44$ ) and intervention ( $3.02\pm0.37$ ) groups was not statistically significant ( $p=0.91$ ). Differences in mean post-test one attitude



**Table II. Knowledge, attitudes, confidence, and comfort means at three time points (n=57)**

	DH3/DT3 (n=31)	DH4/DT4 (n=26)	
Domain	Mean SD	Mean SD	p-value*
<b>HPV Knowledge</b>			
Pre-Test	79.9 ± 6.7	81.7 ± 6.1	0.28
Post-Test 1	84.8 ± 11.2	87.4 ± 4.2	0.26
Post-Test 2	83.7 ± 11.2	84.3 ± 6.8	0.82
<b>HPV Attitudes</b>			
Pre-Test	3.02 ± 0.37	3.01 ± 0.44	0.91
Post-Test 1	3.01 ± 0.47	3.25 ± 0.46	0.07*
Post-Test 2	2.91 ± 0.45	3.14 ± 0.46	0.05*
<b>HPV Confidence</b>			
Pre-Test	2.56 ± 0.83	2.78 ± 0.68	0.28
Post-Test 1	2.82 ± 0.65	3.16 ± 0.65	0.05*
Post-Test 2	2.69 ± 0.78	3.21 ± 0.57	0.006*
<b>HPV Comfort</b>			
Pre-Test	2.97 ± 0.87	2.69 ± 0.74	0.21
Post-Test 1	2.56 ± 0.75	3.16 ± 0.62	0.002*
Post-Test 2	2.83 ± 0.85	2.65 ± 1.02	0.45

\*p values are from two sample t-tests and Fisher's exact tests for the categorical measures.  $p \leq 0.05$

scores between control (3.25±0.46) and intervention (3.01±0.47) and mean post-test two attitude scores between control (3.14±0.46) and intervention (2.91±0.45) were statistically significant ( $p=0.07$ , 0.05).

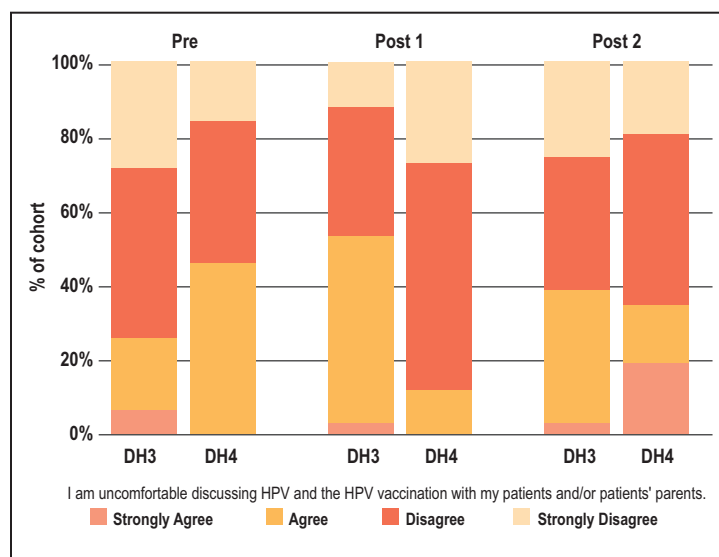
Differences in confidence scores between intervention and control groups were explored by analyzing responses to confidence questions in the attitude questionnaire. Mean pre-test scores did not differ significantly ( $p=0.28$ ) between the control group (2.78±0.68) and intervention group (2.56±0.83). Statistically significant differences ( $p=0.05$ , 0.006) were found in mean scores (post-test one) between control (3.16±0.65) and intervention (2.82±0.65) groups and for mean scores (post-test two) between control (3.21±0.57) and intervention (2.69±0.78) groups; with lower scores indicating weaker confidence.

Mean pre-test comfort scores from the attitude questionnaire between groups were similar (control group 2.69±0.74; intervention group 2.97±0.87;  $p=0.21$ ). A statistically significant difference ( $p=0.002$ ) in mean scores (post-test one) was found between control (3.16±0.62) and intervention

(2.56±0.75) groups, with higher scores indicating more comfort. Mean post-test two scores were similar between control (2.65±1.02) and intervention (2.83±0.85) groups ( $p=0.45$ ). Comfort improved (pre-test to post-test one) in the control group (+0.47,  $p=0.04$ ) and declined in the intervention group (−0.41,  $p=0.05$ ). However, comfort at posttest 2 did not differ significantly from pretest in either group (−0.04,  $p=0.87$ ; −0.16,  $p=0.50$ ). Figure 1 shows differences in comfort discussing HPV and HPV vaccination between groups and across all timepoints.

Confidence and comfort applying BMI during HPV conversations were measured at three time points in the intervention group (Table III). The mean confidences scores were agreeable over all three time points with no statistically significant change over time. Comfort mean scores were consistent over all time points with no statistically significant change.

**Figure 1. Level of comfort discussing HPV with patients across three time points (n=57)**



**Table III. Changes in Confidence and Comfort in using BMI in the intervention group across three time points (n=31)**

Instrument	Time point	Mean SD	p-value*	p-value*
MI Confidence	Pre-Test	5.37 ± 0.73	—	—
	Post-Test one	5.46 ± 0.55	0.55	—
	Post-Test two	5.52 ± 0.54	0.33	0.72
MI Comfort	Pre-Test	—	—	—
	Post-Test one	5.05 ± 0.73	—	—
	Post-Test two	4.83 ± 0.91	—	0.30

\*p values are from two sample t-tests and Fisher's exact tests for the categorical measures.  $p \leq 0.05$

## Discussion

While carcinogen-induced head and neck cancers have declined in recent years, the incidence of HPV-associated OPC continues to increase.<sup>32</sup> Oral health care providers recognize their role in HPV prevention, yet they report barriers to HPV discussions with patients.<sup>17</sup> Professional education and training in communication techniques may prepare oral health care providers with more comfort and confidence to discuss HPV with patients. This study explored the role of an experiential HPV communication training curriculum using BMI on the knowledge, attitudes, confidence, comfort of DH and DT students in HPV communication and vaccine advocacy.

All participants were assigned the same 40-minute HPV online educational module at the beginning of the second semester in the academic year. Students in the intervention group (DH3 and DT3) received additional BMI training to enhance HPV communication skills, while students in the control group (DH4 and DT4) were in their last semester of education and were assigned the HPV educational module only. As the UMN includes the use of MI and BMI throughout the curriculum, the control group did not receive any specific training on the application of BMI to HPV communication strategies.

General knowledge scores regarding HPV, HPV-OPC, and HPV vaccination improved for both groups at the post-test immediately following the educational online module, consistent with previous research conducted regarding dental hygiene students' knowledge and confidence after completing an online education program on HPV-related content.<sup>30</sup> However the knowledge scores in this study decreased slightly following the second patient interaction, suggesting that a one-time educational module is not sufficient to sustain high levels of knowledge over time. Repeated educational sessions may be necessary to clarify, confirm, and activate previously learned HPV information to strengthen knowledge.<sup>33</sup>

Attitudes toward their roles as oral health care providers in HPV prevention were high at the pre-test and remained high following the HPV communication curriculum, with little change. In comparison, Malo et al. reported improved attitudes of medical providers following HPV vaccination conversation training.<sup>11</sup> In this study, the favorable attitudes coupled with increased confidence in HPV conversations, supports HPV communication training to facilitate the HPV counseling practices of future oral health care providers. Applying the theory of planned behavior (TPB), favorable attitudes and improved provider confidence may facilitate effective HPV communication.<sup>31</sup> However, participants

also reported wanting further training and practice in HPV communication. Several participants recommended videos of exemplar HPV conversations in the open-ended responses. These comments support the TBP constructs of perceived power and perceived behavioral control.<sup>31</sup> In order to facilitate HPV communication in practice (perceived behavioral control), one needs further training to be empowered.<sup>31</sup>

Confidence levels in discussing HPV with patients improved following the HPV education module for both groups, although confidence was higher for the control group. This may be explained by several confounding factors. Participants in the control group were in their final semester of the DH program and may possess more confidence in their clinical and patient communication skills. Conversely, participants in the intervention group were in their third semester of the dental hygiene program and did not have as much clinical and communication experience with patients. Further, participants in the control group had been practicing BMI with patients for five semesters, had been evaluated in Objective Structured Clinical Exams, and had received faculty feedback during clinical care.

Research has shown that DH students' confidence in their MI skills develops over time and improves with faculty feedback.<sup>24,29</sup> Practicing clinicians have also reported on the importance of ongoing training to maintain MI skills.<sup>34</sup> Following the second patient interaction, participants in the intervention group students were asked to identify the challenges they experienced during the HPV discussions with patients. Responses fell into two categories: 1) inexperience in BMI technique and 2) lack of confidence in HPV knowledge. Confidence levels may improve with additional BMI training, including faculty feedback and coaching. Based on the knowledge declines that were found at post-test two, an educational module reviewing HPV information, the role of HPV in OPC, and HPV vaccination advocacy may be beneficial.

Although the HPV patient BMI conversations were short (less than five minutes), the confidence level of novice students in the intervention group may have been influenced by the pressure of overall time management considering they were in their second semester of providing patient care. Practicing dental hygienists have reported increased confidence in using MI conversations during clinical care appointments as they became more efficient in time management.<sup>34</sup>

Comfort levels in the intervention group regarding HPV conversations did not improve following at the conclusion of two patient interactions. This finding may be explained by an idealistic, overconfident attitude of beginning students prior to actual patient interactions. Findings from this study are

similar to Bray et al. who reported a slight decrease in student confidence in using MI for behavior change counseling following MI training sessions.<sup>28</sup> Alternatively, other research has shown DH students' comfort and confidence in HPV counseling improved after receiving HPV education in an online format.<sup>30</sup> Audio recording patient interactions for instructors and self-evaluation may have also contributed to the lack of comfort in the intervention group. Audio recording patient conversations is unnatural and students may have been nervous asking patients' permission to record the conversation, particularly regarding a sensitive topic.

This study had limitations. The instruments used in this study were modified from existing questionnaires, and validity was not established. The use of a convenience sample may lead to sampling bias and the results from this study cannot be generalized to other student groups or practicing oral health care professionals. The DH3 and DT3 students' lack of confidence in using a newly learned communication strategy (BMI) may have influenced their responses. Lastly, the aim of data collection was to explore feasibility of an updated HPV curriculum to inform future curricular and research efforts. Therefore, data was unpaired to maintain student anonymity while collecting descriptive statistics. Future studies should be designed to collect paired data to assess influence of an educational intervention on dental hygienists' knowledge, attitudes, confidence, and comfort in HPV communication.

## Conclusion

Results from this study suggest that dental hygiene education programs should include didactic instruction on HPV, the use of BMI strategies, as well as multiple opportunities to practice HPV related conversations with the opportunity for faculty feedback to improve student knowledge, attitudes, comfort, and confidence levels. First year DH and DT students may lack the necessary clinical or communication skills to fully benefit from HPV BMI training. Education programs may want to consider implementing HPV BMI training in the students' senior year when they are more confident in their clinical and patient management skills. Interactive continuing education programs with a focus on HPV and BMI techniques can also assist oral health care providers in the delivery of provider-patient communication on HPV.

## Disclosure

This study was supported by the National Institutes of Health's National Center for Advancing Translational

Sciences, grant UL1TR002494. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health's National Center for Advancing Translational Sciences.

**Cyndee L. Stull, DHSc, MDH, RDH** is an assistant professor and the Director of the Division of Dental Hygiene, Department of Primary Dental Care in the School of Dentistry, University of Minnesota School of Dentistry, Minneapolis, MN, USA.

**Eric Matthews, PhD, RT(R) (CV) (MR), EMT** is an associate professor, College of Graduate Health Studies, A.T. Still University, Mesa, AZ, USA.

**Michael Evans, MS** is a senior biostatistician, Clinical and Translational Science Institute.

**Michelle C. Arnett, MS, RDH** is an assistant professor, Department of Primary Dental Care, Division of Dental Hygiene in the School of Dentistry; both at the University of Minnesota, Minneapolis, MN, USA.

Corresponding author: Cyndee L. Stull, DHSc, MDH, RDH; [stul0045@umn.edu](mailto:stul0045@umn.edu)

## References

1. Guo T, Eisele DW, Fakhry C. The potential impact of prophylactic human papillomavirus vaccination on oropharyngeal cancer. *Cancer*. 2016 Aug 1;122(15):2313–23.
2. Walker KK, Jackson RD, Sommariva S, et al. USA dental health providers' role in HPV vaccine communication and HPV-OPC protection: a systematic review. *Hum Vaccin Immunother*. 2019 Jan 30;15(7):1863–9.
3. Head KJ, Biederman E, Sturm LA, et al. A retrospective and prospective look at strategies to increase adolescent HPV vaccine uptake in the United States. *Hum Vaccines Immunother*. 2018 Jul 3;14(7):1626–35.
4. CDC. United States Cancer Statistics (USCS). Cancers associated with human papillomavirus, United States 2011-2015. (USCS data brief, No. 4) [Internet]. Atlanta: Centers for Disease Control and Prevention; 2018 Aug; [cited 2020 Aug 2]. Available from: <https://www.cdc.gov/cancer/uscs/about/data-briefs/no4-hpv-assoc-cancers-UnitedStates-2011-2015.htm>
5. Daley EM, Vamos CA, Thompson E, et al. The role of dental providers in preventing HPV-related diseases: a systems perspective. *J Dent Educ*. 2019 Feb;83(2):161–72.

6. Dempsey AF, O’Leary ST. Human papillomavirus vaccination: narrative review of studies on how providers’ vaccine communication affects attitudes and uptake. *Acad Pediatr*. 2018 Mar;18(2):S21–2.
7. HHS. Increase the proportion of adolescents who get recommended doses of the HPV vaccine -IID-08. Data [Internet]. Washington (DC); U.S. Department of Health and Human Services; 2020 [cited 2021 Aug 4]. Available from: <https://health.gov/healthypeople/objectives-and-data/browse-objectives/vaccination/increase-proportion-adolescents-who-get-recommended-doses-hpv-vaccine-iid-08/data>.
8. FDA. FDA approves expanded use of Gardasil 9 to include individuals 27 through 45 years old [Internet]. Silver Spring: U.S. Food and Drug Administration; 2018 Oct 5 [cited 2020 Jun 15]. Available from: <https://www.fda.gov/newsevents/newsroom/pressannouncements/ucm622715.htm>.
9. Brewer NT, Hall ME, Malo TL, et al. Announcements versus conversations to improve HPV vaccination coverage: a randomized trial. *Pediatrics*. 2017 Jan;139(1):e20161764.
10. Reno JE, O’Leary S, Garrett K, et al. Improving provider communication about HPV vaccines for vaccine-hesitant parents through the use of motivational interviewing. *J Health Commun*. 2018 Feb 23;23(4):313–20.
11. Malo TL, Hall ME, Brewer NT, et al. Why is announcement training more effective than conversation training for introducing HPV vaccination? A theory-based investigation. *Implement Sci*. 2018 Apr 19;13(1):1–12.
12. Shukla A, Nyambose J, Vanucci R, et al. Evaluating the effectiveness of human papillomavirus educational intervention among oral health professionals. *J Cancer Educ*. 2019 Oct;34(5):890–6.
13. Thompson EL, Daley EM, Vamos CA, et al. Health literacy approaches to improving communication between dental hygienists and patients for HPV-related oral cancer prevention. *J Dent Hyg*. 2017 Aug;91(4):37–45.
14. AAPD. Policy on human papilloma virus vaccinations. Purpose. [Internet]. Chicago (IL): American Academy of Pediatric Dentistry; 2020 [cited 2020 Jun 15]. Available from: <https://www.aapd.org/research/oral-health-policies--recommendations/human-papilloma-virus-vaccinations/>.
15. ADA. Cancer (head and neck). ADA policy on HPV vaccination [Internet]. Chicago (IL): American Dental Association; 2018 [cited 2020 Jun 15]. Available from: <https://www.ada.org/en/member-center/oral-health-topics/cancer-head-and-neck>.
16. Kline N, Vamos C, Thompson E, et al. Are dental providers the next line of HPV-related prevention? Providers’ perceived role and needs. *Papillomavirus Res*. 2018 Jun;5:104–8.
17. Stull CL, Lunos S. Knowledge, attitudes and practices regarding human papilloma virus communication and vaccine advocacy among Minnesota dentists and dental hygienists. *J Dent Hyg*. 2019 Feb;93(1):33–42.
18. Vázquez-Otero C, Vamos CA, Thompson EL, et al. Assessing dentists’ human papillomavirus–related health literacy for oropharyngeal cancer prevention. *J Am Dent Assoc*. 2018 Jan;149(1):9–17.
19. Stull C, Freese R, Sarvas E. Parent perceptions of dental care providers’ role in human papillomavirus prevention and vaccine advocacy. *J Am Dent Assoc*. 2020 Aug;151(8):560–7.
20. Blankenship KA, Stull CL, Arnett MC, et al. A survey of human papillomavirus content inclusion in U.S. dental hygiene program curricula. *J Dent Hyg*. 2021 Apr;95(2):42–9.
21. Rollnick S, Mason P, Butler C. Health behavior change: a guide for practitioners. Edinburgh: Churchill Livingstone, 1999. 225p.
22. Edwards EJ, Stapleton P, Williams K, et al. Building skills, knowledge, and confidence in eating and exercise behavior change: brief motivational interviewing training for healthcare providers. *Patient Educ Couns*. 2015 May; 98(5):674–76.
23. Poirier MK, Clark MM, Cerhan JH, et al. Teaching motivational interviewing to first-year medical students to improve counseling skills in health behavior change. *Mayo Clin Proc*. 2004 Mar;79(3):327–31.
24. Mills A, Kerschbaum WE, Richards PS, et al. Dental hygiene students’ perceptions of importance and confidence in applying motivational interviewing during patient care. *J Dent Hyg*. 2017 Feb;91(1):15–23.
25. Catley D, Goggin K, Lynam I. Motivational interviewing (MI) and its basic tools. In: Ramseyer CA, Suvan JE, editors. Health behavior change in the dental practice. Ames (IA): Wiley-Blackwell; 2010. p. 59–92.
26. Arnett M, Korte D, Richards P, et al. Effect of faculty development activities on dental hygiene faculty perceptions of and teaching about motivational interviewing: a pilot study. *J Dent Educ*. 2017 Aug;81(08):969–77.



27. Koerber A. Brief interventions in promoting health behavior change. In: Ramseier CA, Suvan JE editors. Health behavior change in the dental practice. Ames (IA): Wiley-Blackwell; 2010. p. 93-112.
28. Bray KK, Catley D, Voelker MA, et al. Motivational interviewing in dental hygiene education: curriculum modification and evaluation. *J Dent Educ.* 2013 Dec;77(12):1662-9.
29. Croffoot C, Krust Bray K, Black M, et al. Evaluating the effects of coaching to improve motivational interviewing skills of dental hygiene students. *J Dent Hyg.* Spring 2010;84(2):57-64.
30. Cotter JC, Wilson KJ, Mallonee LF. Impact of HPV immunization training on dental hygiene students' attitudes and confidence regarding HPV preventive education. *J Dent Educ.* 2020 Jan; 84(1):88-93.
31. LaMorte WW. Behavioral change models. The theory of planned behavior [Internet]. Boston: Boston University School of Public Health; 2019 Sept 9; [cited 2020 Jun 15]. Available from: <http://sphweb.bumc.bu.edu/otlt/MPH-Modules/SB/BehavioralChangeTheories/BehavioralChangeTheories3.html>.
32. You EL, Henry M, Zeitouni AG. Human papillomavirus-associated oropharyngeal cancer: review of current evidence and management. *Curr Oncol.* 2019 Apr;26(2):119-23.
33. Rosenshine B. Principles of instruction. *Am Educ.* 2012; Spring:12-39.
34. Curry-Chiu ME, Catley D, Voelker MA, et al. Dental hygienists' experiences with motivational interviewing: a qualitative study. *J Dent Educ.* 2015 Aug;79(8):897-906.