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Role of the Pediatric Dental Provider in Human Papillomavirus (HPV) Education

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science
in Dentistry at Virginia Commonwealth University.

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Table of Contents

Acknowledgments.....	ii
List of Tables	iv
List of Figures.....	v
Abstract.....	vi
Introduction.....	1
Discussion.....	16
Conclusions.....	22
Literature Cited.....	23
Appendix.....	30

List of Tables

Table 1: Stages of Change	7
Table 2: Sample Demographics	9
Table 3: Results from Knowledge Questions at Baseline and Initial Follow-up.....	10
Table 4: Stages of Change at Baseline and Follow-up	11
Table 5: Attitudes Towards Vaccinating Against HPV after Intervention	11
Table 6: Knowledge Over Time for Individuals with 6-month Follow-up	13
Table 7: Readiness for Change at 6-month Follow-up	15

List of Figures

Figure 1: Correct Responses to Knowledge Questions Over Time (n=17)14

Abstract

ROLE OF THE PEDIATRIC DENTAL PROVIDER IN HUMAN PAPILLOMAVIRUS (HPV) EDUCATION

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Virginia Commonwealth University, 2017

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Purpose: This study investigates knowledge about HPV and examines if pediatric dental providers should include HPV education for guardians of patients 10-18 years.

Methods: Legal guardians of 10-18 year-old patients of the Virginia Commonwealth University Pediatric Dental Clinic were enrolled in this prospective cohort study. Participants completed a baseline survey, were provided HPV education, completed an initial follow-up survey, and then completed a 6-month follow-up survey.

Results: A total of 54 participants completed the baseline and initial follow-up surveys and 17 completed the 6-month follow-up survey. The average number of correct responses was 3.4 of 6

knowledge questions, which significantly improved to 5.4 at follow-up ($P<.0001$). The greatest increase in the percent responding correctly was regarding HPV and oropharyngeal cancer from 22% baseline to 91% at initial follow-up ($P<.0001$). Regarding Stage of Change, 14 (23%) of those not initially in the Action group had improved at least 1 stage. At the 6-month follow-up, 3 (43%) guardians reported completing the HPV vaccine series.

Conclusions: These results demonstrate limited knowledge about HPV and highlight the pediatric dental provider's ability to educate. Since the greatest knowledge gap pertained to HPV and oropharyngeal cancer, it is important for pediatric dental providers to increase their role in HPV education. As oral cancers are the purview of dentists, practitioners should be involved with their patients' consideration of the HPV vaccine.

Introduction

Human papillomavirus (HPV) is mostly known in the United States due to its serious and potentially life-threatening associations such as cervical cancers and genital warts; however, many Americans do not understand much about the virus.¹ Even less is known by the general public about other consequences of the virus outside of the cervical region, particularly cancers of the oropharynx.² HPV is associated with cancers of the oropharynx region which is described as the area including the palatine and lingual tonsils, posterior one-third of the tongue, soft palate, and posterior pharyngeal wall.^{3,4} According to a recent Centers for Disease Control and Prevention (CDC) report, HPV related cancers of the oropharynx and cervix are increasing, whereas cancers of the oral cavity are decreasing.^{4,5} HPV vaccines that protect against the strains that cause cervical cancer are available, and it is likely that the same HPV vaccines are effective in preventing HPV infections in the oropharynx due to the same strains causing most cervical and oropharyngeal cancers.⁴ Because HPV-related cellular changes are found in the oropharyngeal region, it is important that dentists are able to identify possible HPV-related infections and are able to communicate about HPV with their patients.⁴

HPV is the most common sexually transmitted infection in the US and it is associated with approximately 4% of all human cancers.^{6,7} HPV infections are very common in Americans with approximately 79 million people currently infected with HPV and approximately 14 million new infections yearly.^{8,9} Most sexually active Americans will develop at least one HPV infection in their lifetime, many of which are cleared by the human body naturally within two years.^{8,4} Activities that increase the risk of transmission of HPV include open-mouth kissing and oral

sex.^{4,10} If the infection persists, the risk of other significant problems such as genital warts or cancers increase.^{8,4} Individuals with compromised immune systems are also more likely have HPV infections that their immune system is unable to clear.⁸

There are over 100 types of HPV.⁴ Some strains are associated with cancers, genital warts, or other cellular changes.⁴ Infection with certain HPV strains may lead to anogenital cancers including anal, vaginal, vulvar, penile, cervical, and oropharyngeal cancers.⁶ HPV accounts for approximately 99% of all cervical cancers and 66-70% of oropharyngeal cancers that affect both men and women.^{6,11-13} Specifically, HPV-16 and HPV-18 account for 90-95% of all HPV-related head and neck cancers and 80-90% of HPV-related cervical cancers.^{4,5,14} In the oropharynx, HPV has a preference for lymphoepithelial tissue of the Waldeyer ring and is most commonly spread through deep kissing or oral sex, but may also be spread by vertical transmission.^{4,15-17}

While HPV-related cancers are more common in women, approximately 36% of HPV-related cancers occur among men.¹³ In general, oropharyngeal cancers are about four times as common in men than in women.¹³ Recent data shows that in the United States more than 31,000 new cases of HPV-associated oropharyngeal cancers are diagnosed in women and 12,638 are diagnosed in men each year.¹⁸

There are multiple ways to avoid HPV and HPV-associated health problems. These include safe sex practices such as condom use during sexual activity, mutually monogamous relationships, and abstinence.^{8,19} Vaccines are available to prevent multiple strains of HPV, including high-risk types HPV-16 and HPV-18 which are more likely to cause cancer, and low-risk types HPV-6 and HPV-11 that cause genital warts.^{9,19,20} Two types of HPV vaccines are currently used in the United States, including quadrivalent and 9-valent types.^{9,21,22} The

quadrivalent and 9-valent types protect against HPV-6, HPV-11, HPV-16, and HPV-18.⁹ In addition, the most recent 9-valent vaccine can prevent HPV types 31/33/45/52/58 which are responsible for about 10% of HPV-associated cancers.^{9,12} Timing of the vaccination is crucial, and it is important that the vaccine be given before any possible sexual exposure.²³ It is recommended that the HPV vaccines be given to both male and female children between the ages of 11-12 and as early as 9, with catch-up doses available until age 26 for females and age 21 for males.²⁴ In a recent 2016 update, the CDC recommends that healthy 9- to 15-year-olds who receive the vaccine may receive two doses of the HPV vaccine at least 6-12 months apart and other teens and young adults who start the series after 15 years of age must have three doses of the HPV vaccine to be effective.²⁵ However, males may receive the vaccine until age 26 if they are immunocompromised or are having sex with men.²⁴ It is important that every child be immunized to enhance herd effects and limit disease burden.^{11,26}

Multiple barriers to HPV vaccination have been identified, with provider recommendation being the strongest predictor of adolescent HPV vaccination.^{6,27-29} Research shows that only 15-64% of physicians report that they recommend the HPV vaccine to early adolescents.³⁰⁻³² Providers are also much less likely to recommend the vaccine to males and guardians of male children.³¹ Lack of awareness and inadequate information and knowledge about HPV has also been shown to be a significant barrier to vaccination.^{6,1,33,34} In a study regarding the knowledge of adolescent girls regarding HPV, they found that 40.9% of adolescent women who declined the vaccine stated the reason they declined was due to inadequate information.¹ Strides are being made to increase awareness of HPV and the HPV vaccine, including a recent Merck 2016 campaign to publicize possible consequences of HPV in both men

and women. According to research, other barriers include the cost of the vaccine, concerns regarding sexual activity, safety concerns, and healthcare access.^{6,27,28,31,2,30}

It is estimated that 39.9% of females and 5.9% of males received the HPV vaccine in 2013.³⁵ Of those, only 2% of females and 9% of males reported receiving the first dose at age 11-12 which is the ideal age of vaccination.³⁵ It is very important to vaccinate children during the appropriate age range because HPV vaccines are preventive and not therapeutic.^{23,36} In order to increase vaccination rates in the United States parents and adolescents need to learn about HPV, and providers need to regularly recommend the vaccine.⁶ A limited number of providers are recommending the vaccine. As a result, parents who otherwise might choose to vaccinate their children are not even given the option. Low vaccination rates are a public health concern due to the highly infectious nature of HPV.^{35,37}

The purpose of this study has three aims: First, to determine the effects of education and provider recommendation in the pediatric dental setting on knowledge and understanding of HPV; second, to determine the guardian's readiness for change regarding HPV vaccination for their children before and after education in the pediatric dental setting; and third, to determine HPV vaccine follow-up in those patients who were not yet vaccinated and whose guardian received educational information.

Materials and Methods

This prospective cohort study was approved by the Institutional Review Board, Committee on Human Research of Virginia Commonwealth University (VCU), Richmond, Virginia. Those consenting to participate in the study were recruited from the VCU Pediatric Dental Clinic between May 2016 and September 2016. Participants were required to be a legal guardian of one or more of the clinic's patients 10-18 years of age who presented for a new patient comprehensive or six-month periodic exam. Exclusion criteria included non-English speaking guardians, guardians who chose not to participate in the study, and guardians who completed less than 50% of the initial survey questions.

After the aims and procedures of the study were explained to the eligible participant, informed consent was obtained. The guardian then completed an 18-item questionnaire regarding demographic information, attitude, awareness, and knowledge of HPV. Questions to determine the participants Stage of Change were also incorporated in the questionnaire. The Stage of Change questions were modeled after an instrument developed at the University of Rhode Island, provided by Dr. Andrea Paiva (Table 1). Educational materials provided by the CDC and the investigators were given to the participant to read. Clarifying questions were answered but no other discussion took place at this time. Following the educational information, an 8-item survey was given to the participant with questions that were repeated from the first survey including the Stage of Change question. Participants were then able to ask questions and comment on their own experiences if they so desired. All activities including obtaining consent, taking surveys, and education took place in the participant's child's operatory room during the child's dental appointment. Approximately six months following the initial survey date participants were

contacted via email or phone for a final survey. For those who provided an email address, a survey was emailed to them. Participants who provided a phone number were called directly and asked the survey questions verbally. Six-month follow-up surveys were sent the first Monday of the month closest to the 6-month follow-up date. Participants that enrolled at the end of May and during the month of June were sent the follow-up survey the first Monday of December, participants that enrolled in July were sent the follow-up survey the first Monday of January, and those who enrolled in August and the beginning of September were sent the follow-up survey the first Monday of October. Study data were collected and managed using Research Electronic Data Capture (REDCap) electronic data capture tools system.³⁸ REDCap is a secure, web-based application designed to support data capture for research studies.

Approval for this study was obtained from the Institutional Review Board, Committee on Human Research (VCU IRB# HM 20006593).

Table 1: Stages of Change

Have any of your children initiated the HPV vaccine series (had at least 1 shot in the series)?	Stage of Change
Yes, and they have completed the series	Action/Maintenance
Yes, and they will complete the series	Preparation
Yes, but they will not complete the series	Precontemplation
No, but they will be starting the series in the next 30 days	Preparation
No, but they will be starting the series in the next 6 months	Contemplation
No, and I have not thought about them starting the HPV vaccine series	Precontemplation
No, and I do not what then to be vaccinated for HPV	Precontemplation

Statistical Methods

Sample demographics were summarized using descriptive statistics. Changes in correct responses for various knowledge questions were compared using McNemar's Chi-squared test. Changes in overall number of questions correct was tested using paired t-test. Changes in Stage of Change were assessed using McNemar's Chi-squared. All analyses were performed in SAS EG v. 6.1 with a 0.05 significance level.

Results

A total of 56 individuals enrolled in the study, of which 54 completed the baseline and initial follow-up surveys, and 17 completed the 6-month follow-up survey. Participants were predominantly female (92%) with 1-2 children aged 10-18 (78%). Full demographics are given in Table 2.

Table 2: Sample Demographics

		n, %		
		Total Sample (n=54)	6 Month Follow-up (n=17)	P-value*
Gender				0.2929
	Male	4, 8%	0, 0%	
	Female	49, 92%	17, 100%	
Number of Children 10-18				0.6985
	1	28, 53%	8, 47%	
	2	13, 25%	6, 35%	
	3	8, 15%	2, 12%	
	4+	4, 8%	1, 6%	
Children 19+				0.3995
	0	34, 65%	9, 53%	
	1	12, 23%	6, 35%	
	2	2, 4%	1, 6%	
	3	2, 4%	1, 6%	
	4+	2, 4%	0, 0%	
Race/Ethnicity**				
	Black or African American	35, 65%	11, 65%	1
	Hispanic/Latino	4, 7%	1, 6%	1
	White	16, 30%	6, 36%	0.5402
	American Indian/Alaska Native	1, 2%	0, 0%	1
	Asian	1, 2%	0, 0%	1
Parent's Education Level				0.1159
	Some High School	7, 13%	2, 12%	
	High School	17, 33%	2, 12%	
	Associates Degree	6, 12%	2, 12%	
	Some College	15, 29%	8, 47%	
	College Graduate	4, 8%	1, 6%	
	Master's Degree	3, 6%	2, 12%	
Parent's Age				0.5109
	20-30	6, 11%	2, 12%	
	31-40	24, 44%	7, 41%	
	41-50	16, 30%	7, 41%	
	50+	8, 15%	1, 6%	

*P-value from Fisher's Exact Test of Demographics between those who completed 6-month follow-up and those who did not

**Participant was able to select multiple answer choices

Knowledge Questions

At baseline, the average number of correct responses for each respondent was 3.4 out of 6 questions. There was a significant improvement at follow-up with an average number of correct responses increasing to 5.4 (p-value<0.0001). Looking at the individual questions, the greatest increase in the percent responding correctly was seen in “Does Human Papillomavirus cause mouth or throat (oropharyngeal) cancer?” At baseline, only 22% of respondents correctly selected “Yes” and at follow-up this increased to 91% (p-value<0.0001). Complete breakdown of questions is given in Table 3.

Table 3: Results from Knowledge Questions at Baseline and Initial Follow-up

Individual Questions	n, % Correct		P-value*
	Baseline	Initial Follow-up	
Do you think it is important for female adolescents between the ages of 11-26 to receive the HPV vaccine?	45, 83%	51, 94%	0.0339
Do you think it is important for male adolescents between the ages of 11-26 to receive the HPV vaccine?	45, 83%	52, 96%	0.0082
Does Human Papillomavirus cause cervical cancer?	30, 56%	49, 91%	<0.0001
Does Human Papillomavirus cause mouth or throat (oropharyngeal) cancer?	12, 22%	49, 91%	<0.0001
Can people spread Human Papillomavirus without knowing it?	25, 46%	47, 87%	<0.0001
Is getting Human Papillomavirus preventable by getting the HPV vaccine?	28, 52%	46, 85%	<0.0001

*McNemar's Chi-Squared

Stage of Change

At baseline, 21 of the 54 participants reported their child had already completed or started the HPV series. Among the remaining participants, 7 were in Preparation, 7 were in Contemplation, and 17 were in Precontemplation (2 did not respond). At the initial follow-up, there were not any changes among those in Preparation or Contemplation. Seven of the 17 in Precontemplation had

improved to either Preparation (n=2, 11%) or Contemplation (n=5, 29%). None of the respondents regressed in their Stage of Change. Full results are given in Table 4.

Table 4: Stages of Change at Baseline and Follow-up

Baseline	Follow-Up #1				Total
	Action	Preparation	Contemplation	Precontemplation	
Action	21	0	0	0	21
Preparation	0	7	0	0	7
Contemplation	0	0	7	0	7
Precontemplation	0	2	5	10	17
Total	21	9	12	10	52

Overall, 89% of respondents responded that they were more likely to vaccinate their children against HPV after learning more about it from their pediatric dental provider (Table 5).

Table 5: Attitudes Towards Vaccinating Against HPV after Intervention

Which of the following best describes your attitude towards the HPV vaccine?	n, %
I am more likely to vaccinate my child(ren) against HPV since learning more about it	47, 89%
There is the same likelihood I will vaccinate my child(ren) against HPV	5, 9%
I am less likely to vaccinate my child(ren) against HPV since learning more about it.	1, 2%

Six Month Follow-up

A total of 17 participants completed the 6-month follow-up questionnaire, for a 6-month follow-up rate of 31%. Demographic variables were compared with those who did not respond to determine if there was respondent bias. There were no differences in gender, age, race/ethnicity, education level, or number of children (Table 2).

Knowledge Questions

Responses to knowledge questions maintained an improvement over baseline but a decrease from the post-education knowledge (Figure 1). The greatest decrease in knowledge was seen for the question regarding HPV and oropharyngeal cancer (94% to 53%). The decrease in knowledge from post-education to 6-month follow-up was not statistically significant for the questions regarding: importance of males (p-value=0.4795) or females (p-value=0.4795) receiving HPV vaccine, HPV causing cervical cancer (p-value=0.3173), or HPV vaccine being preventative (p-value=0.1025).

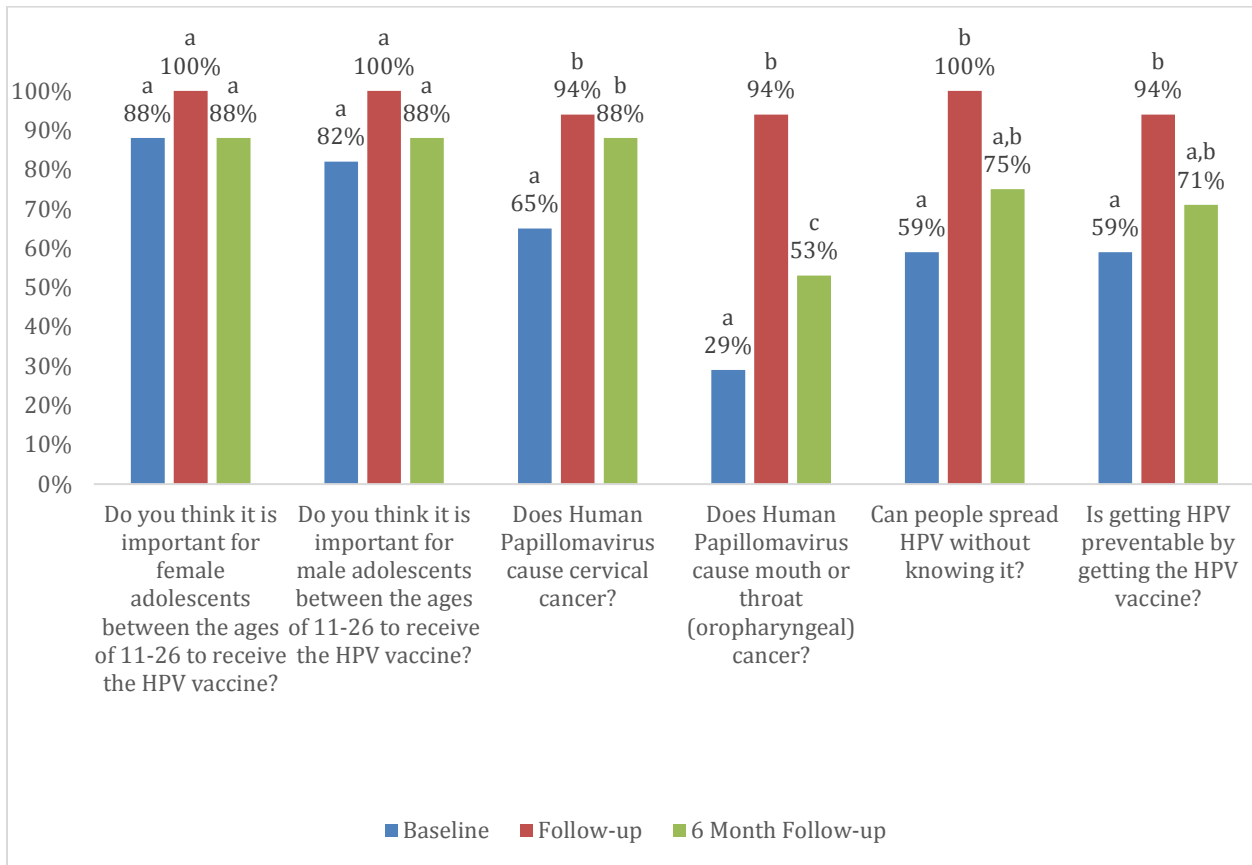
Table 6: Knowledge Over Time for Individuals with 6-month Follow-up

Individual Questions	n, %			P-values*		
	Baseline	Initial Follow-up	6 Month Follow-up	Baseline: Follow-up	Baseline: 6-Month	Follow-up: 6 Month Follow-up
Do you think it is important for female adolescents between the ages of 11-26 to receive the HPV vaccine?	15, 88%	17, 100%	15, 88%	0.4795	1	0.4795
Do you think it is important for male adolescents between the ages of 11-26 to receive the HPV vaccine?	14, 82%	17, 100%	15, 88%	0.2482	0.5637	0.4795
Does Human Papillomavirus cause cervical cancer?	11, 65%	16, 94%	15, 88%	0.0253**	0.0455**	0.3173
Does Human Papillomavirus cause mouth or throat (oropharyngeal) cancer?	5, 29%	16, 94%	9, 53%	0.0009**	0.0455**	0.0196**
Can people spread HPV without knowing it?	10, 59%	16, 100%	12, 75%	0.0233**	0.0833	0.1336
Is getting HPV preventable by getting the HPV vaccine?	10, 59%	16, 94%	12, 71%	0.0143**	0.1573	0.1025

*McNemar's Chi-Squared

**Significant at alpha = 0.05

Figure 1: Correct Responses to Knowledge Questions Over Time (n=17)



*Timepoints with different letters were significantly different from McNemar’s chi-squared tests

Readiness for Change

At the 6-month follow-up, 4 of the 17 respondents demonstrated an increase in their Stage of Change for HPV vaccination (Table 6). Three participants had moved into Action, indicating completion of the HPV vaccine for at least one child in the 6-month time period. At 6-month follow-up no participants were staged as Precontemplation. Two remained in Contemplation and one in Preparation. One respondent failed to respond to the question regarding their Stage of Change.

Table 7: Readiness for Change at 6-month Follow-up

Baseline	6 Month Follow-up				Total
	Action	Preparation	Contemplation	Precontemplation	
Action	9	0	0	0	9
Preparation	1	1	0	0	2
Contemplation	1	1	2	0	4
Precontemplation	1	0	0	0	1
Total	12	2	2	0	16

Discussion

Human papillomavirus (HPV) is highly infectious and it is estimated that 14 million new infections occur every year, affecting people of all races and genders.⁸ Although the virus infects a high percentage of Americans, there are vaccines available that prevent the most malignant strains of HPV. HPV affects males and females but the vaccine has historically been targeted at females due to the prevention of up to 90% of HPV-related cervical cancers.^{11,39} We now understand more about the virus and that it causes many types of cancers in both sexes including cervical, vulvar, vaginal, penile, anal and oropharyngeal cancers. Oropharyngeal cancers are approximately 4 times more common in males than in females, however less men are vaccinated against HPV than females.¹⁸ It has been shown that HPV is associated with 12-70% of oropharyngeal cancers.^{39,40} There are very low vaccination rates in Americans which is a concern due to the highly infectious and potentially malignant nature of HPV.^{4,40-42} Families regularly visit their pediatric dentist every six months from ages one year to 18 years, which gives pediatric dentists a unique opportunity to impact both their dental and overall health. Due to effects of HPV on the oropharynx, pediatric dentists may be an ideal healthcare provider to educate and recommend the HPV vaccine to their patients in the age range of 10-18 years in addition to their primary care medical provider.

The sample demographics can be seen in Table 2. The majority of participants were female and Black or African American. This is expected due to the urban location of the VCU Pediatric Dental Clinic in Richmond, VA. It has also been demonstrated that mothers are more likely than fathers to accompany their children to dental appointments which is the case for this sample.⁴³ The majority of our participants had one child aged 10-18 years, but it was also

common to have two children in that age range, or one child that was over 19 and one that was between 10-18 years old. This is important because it has been shown that many pediatricians do not recommend the HPV vaccine until at earliest 10 years of age, but more commonly 13-15 years, if at all.^{2,30,44} According to the Advisory Committee on Immunization Practices (ACIP), the recommended age of vaccination is 11-12 years but the vaccine may be given as soon as 9 years.²⁵

Results of this study suggest that written educational information at the pediatric dental office is a successful way to educate guardians about HPV. Participants answered 5.4 out of 6 questions correctly following written educational information about HPV which significantly increased from a response of 3.4 correct answers prior to education (p-value<0.0001) (Table 3). Following education, 89% of participants reported that they were more likely to vaccinate their child against HPV (Table 5). These results demonstrate that education in a written format is effective and that they are more likely to act after receiving educational information about HPV. Findings by Dempsey et al. also show that written information is a successful way to educate parents about HPV and research by Chan et al. and Davis et al. also demonstrate that when guardians read information about HPV they become more supportive of the HPV vaccine.⁴⁵⁻⁴⁷ While this research supports previous findings, this is the first study to educate about HPV in the pediatric dental office.

While at baseline, 83% of participants in this study understood that the HPV vaccine was important to both males and females, national vaccination rates are nowhere near the national goal of 80%.⁴⁸ In 2012, 28.1% of females and 6.9% of males aged 13-15 had received at least three doses on the HPV vaccine, with males having much lower vaccination rates than females.^{31,47,48} This raises concerns about barriers that families face regarding HPV vaccination.

Berenson et al. described many barriers that affect vaccination rates with the greatest barriers being provider recommendation and inadequate information and knowledge.⁶ While some guardians understand that HPV vaccination is important, it has been shown that physicians are not recommending the vaccination regularly which plays a role in low vaccination rates.⁴⁷ Berkowitz et al. found that only 14.5% of physicians recommend the vaccine to all age-appropriate females.² Javanbakht et al. demonstrated that pediatric medical providers may perceive parental misconceptions as a barrier to HPV recommendation, which could be overcome with education.⁴⁹

At baseline, 91% of participants had heard of HPV or the HPV vaccine but only 41% of the participants were in the Action stage of change, and 13% were in the Preparation stage of change. Immediately following education, five participants that were in Precontemplation improved to Contemplation and two improved to Preparation (Table 4). It is important to note that no participants regressed in their stage of change, showing that education only improved the chance of participants getting the vaccine for their children. Because of a discrepancy of participants who had heard about HPV and how many children had actually received the vaccine, it is possible that participants had heard about the vaccine through television commercials, advertisements, or word-of-mouth but it was not addressed at their children's well-child visits. This information further suggests that many of the participants had barriers to overcome before getting the vaccine.

At baseline, only 52% thought that getting HPV was preventable by the vaccine and 56% understood that HPV could cause cervical cancer (Table 3). Even less (22%), knew that HPV could cause oropharyngeal cancer (Table 3). Research by Berkowitz et al. shows that physicians are knowledgeable about the fact that HPV vaccine prevents cervical cancer but are much less

likely to be knowledgeable of other HPV-associated cancers including those of the oropharynx.² This is important because if physicians are not knowledgeable about all HPV-associated cancers, they are not able to educate and recommend the vaccine appropriately. This demonstrates that only 38% of pediatricians know that HPV is effective in preventing oropharyngeal cancer, and it is even lower in OB/GYNs (34%) and internists (20%).² Following education, correct answers to “Does HPV cause cervical cancer?” and “Does HPV cause mouth or throat (oropharyngeal) cancer?” increased to 91% for both questions (p-value <0.0001) (Table 3).

The results of this study show that the majority of participants were more likely think positively about HPV and act in a positive way concerning the HPV vaccine after learning about it at their pediatric dentist office. Previous research has not taken place in the pediatric dental setting but it has surveyed the general public, adolescents, or parents and as well patients in a medical setting. Involving the pediatric dentist in education combats the major barriers to HPV vaccination including provider recommendation, lack of knowledge, and access to information. Due to HPV’s predilection for the oropharynx and oral cavity, pediatric dentists have a responsibility to their patients to make sure they are educated about HPV and prevention strategies.

The American Academy of Pediatric Dentistry (AAPD) has a Child and Adolescent Vaccination Schedule in the AAPD 2016-17 Definitions, Oral Health Policies, and Clinical Practice Guidelines which has been approved by the Advisory Committee on Immunization Practices (ACIP).⁵⁰ The Childhood and Adolescent Immunization Schedule does not list the pediatric dentist’s responsibilities as far as educating or upholding the vaccination schedule for their patients. It is assumed that the pediatric dentist should be aware of the schedule but they do not have any further specific obligations by the AAPD to uphold the schedule. Just being aware

of the schedule and relying on the child's pediatrician to enforce the HPV vaccine is not enough, as demonstrated by the very low vaccination rates in the United States. This innovative research suggests that pediatric dentists should consider including HPV education and an HPV vaccine recommendation as part of their anticipatory guidance for parents of children age 9-18 in order to increase vaccination rates and prevent HPV-associated cancers.

Patients are regularly seen every 6 months by their pediatric dental provider from age 1 through age 18 or 21. If a patient visits their pediatric dental provider every six months beginning at age one, they will see their pediatric dentist at least 18 times before the patient turns 9 years old, which is the youngest age the HPV vaccine may be given. If the patient has dental caries that need to be addressed the number of appointments is increased. This gives providers a significant amount of patient contact time to build rapport before they begin discussing HPV and the HPV vaccine with parents of their patients. Due to the frequent visits and the strong relationships that pediatric dental providers build with their patients, pediatric dentists should be involved in the discussion of their overall health including HPV and the HPV vaccine.

The limitations of this study are important to note. The demographics of the study may not be generalizable due to the location and primarily Black or African American and low socioeconomic patient population of the VCU Pediatric Dental Clinic as well as the majority of female participants. This study was based on participant report through surveys which relies on the participant being engaged in the education and taking time to fully complete the surveys which could result in recall bias. There was a 100% response rate at the first follow-up, but it decreased significantly at the 6-month follow-up where the participation rate was 33%.

Future research includes varying the way that educational information is presented such as using verbal education and motivational interviewing. An outcome-based longitudinal

prospective study would be valuable to determine the long-term effects of HPV education in the pediatric dentist and the effects on actual vaccination rates.

Conclusions

The purpose of this study was to investigate the public's knowledge about HPV and examine if pediatric dentists should include HPV education for guardians due to the increasing HPV-associated oropharyngeal cancer rates. Prior to education, only 22% of participants knew that HPV could cause oropharyngeal cancer which significantly improved to 91% (p-value<0.0001) following education. Eighty-nine percent of participants reported they were more likely to vaccinate their child for HPV following the intervention. Following education, no participants regressed in their stage of change, and 5 moved from Precontemplation to Contemplation and 2 moved from Precontemplation to Preparation. HPV education in the pediatric dental setting is effective and it increases the likelihood that guardians will vaccinate their child for HPV. The lack of knowledge, especially relating to oropharyngeal cancer, indicates the responsibility of pediatric dental providers to educate guardians about HPV vaccination at every periodic and comprehensive exam for patient age 10-18 years.

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Appendix

Role of the Pediatric Dentist in Human Papillomavirus (HPV) Education

Thank you for agreeing to be a participant in this study. Please complete the following questions.

Envelope Number: _____

What is your gender?

- Male
 Female
 Other

If you selected "Other" gender, please use the space provided to explain, if desired.

What is your age?

- 18-20 years old
 20-30 years old
 31-40 years old
 41-50 years old
 Greater than 50 years old

Please select your race/ethnicity (Select all that apply):
(Check all that apply)

- American Indian or Alaska Native
 Asian
 Black or African American
 Hispanic or Latino
 Native Hawaiian or Other Pacific Islander
 White
 Other

Please select your level of education:

- Some high school
 High school graduate
 Associates degree
 Some college
 College graduate (bachelor's degree)
 Master's degree
 Professional degree
 Doctoral degree

How many children with age 10-18 do you have?

- 0 children
 1 child
 2 children
 3 children
 4 or more children

How many children age 19 and older do you have?

- 0 children
- 1 child
- 2 children
- 3 children
- 4 or more children

Have you heard of the human papillomavirus (HPV) or the HPV vaccine?

- Yes
- No

Have any of your children completed the HPV vaccine series?

- Yes
- No

Have any of your children initiated the HPV vaccine series (had at least 1 shot in the series)?

- Yes, and they have completed the series
- Yes, and they will complete the series
- Yes, but they will not complete the series
- No, but they will be starting the series in the next 30 days
- No, but they will be starting the series in the next 6 months
- No, and I have not thought about them starting the HPV vaccine series
- No, and I do not want them to be vaccinated for HPV

Do you think it is important for female adolescents between the ages of 11-26 to receive the HPV vaccine?

- Yes
- No
- Unsure

Do you think it is important for male adolescents between the ages of 11-26 to receive the HPV vaccine?

- Yes
- No
- Unsure

Has a doctor or other health professional ever recommended the HPV vaccine for your child/children?

- Yes
- No

Does Human Papillomavirus cause cervical cancer?

- Yes
- No
- Unsure

Does Human Papillomavirus cause mouth or throat (oropharyngeal) cancer?

- Yes
- No
- Unsure

Can people spread HPV without knowing it?

- Yes
- No
- Unsure

Is
getting
HPV
preventable
by
getting
the
HPV
vaccine?

- Yes
- No
- Unsure

Follow-Up HPV Survey

Please complete the following survey after you have read the educational material and discussed HPV with your provider.

Have any of your children initiated the HPV vaccine series (had at least 1 shot in the series)?

- Yes, and they have completed the series
- Yes, and they will complete the series
- Yes, but they will not complete the series
- No, but they will be starting the series in the next 30 days
- No, but they will be starting the series in the next 6 months
- No, and I have not thought about them starting the HPV vaccine series
- No, and I do not want them to be vaccinated for HPV

Do you think it is important for female adolescents between the ages of 11-26 to receive the HPV vaccine?

- Yes
- No
- Unsure

Do you think it is important for male adolescents between the ages of 11-26 to receive the HPV vaccine?

- Yes
- No
- Unsure

Has a doctor or other health professional ever recommended the HPV vaccine for your child/children?

- Yes
- No

Does Human Papillomavirus cause cervical cancer?

- Yes
- No
- Unsure

Does Human Papillomavirus cause mouth or throat (oropharyngeal) cancer?

- Yes
- No
- Unsure

Can people spread HPV without knowing it?

- Yes
- No
- Unsure

Is getting HPV preventable by getting the HPV vaccine?

- Yes
- No
- Unsure

Which of the following best describes your attitude towards the HPV vaccine?

- I am more likely to vaccinate my child(ren) against HPV since learning more about it
- There is the same likelihood I will vaccinate my child(ren) against HPV
- I am less likely to vaccinate my child(ren) against HPV since learning more about it.

Questions/Comments:

HPV Survey 6 Month Follow-up

The purpose of this research project is to investigate parents' of adolescents attitudes and awareness regarding human papillomavirus (HPV) and HPV vaccines. You are being asked to participate in this study because you are the parent of a child between the ages of 10-18 and provided your email address for a 6-month follow-up. If you no longer wish to participate, you can stop at any time.

If you decide to participate in this project, you will be asked to fill out a questionnaire about your attitudes and awareness of HPV. The survey will last approximately 5 minutes. Participation is voluntary and you can withdraw at any time. There are no costs for participating in this study other than the time you will spend filling out the survey and the information you gain through the education. If you complete all 3 surveys you will be entered into a random drawing to win 1 of 5 Kindle Fire tablets. If you win, you will be contacted via the email you provide on the initial survey.

Data will be collected only for research purposes. Any and all data will be kept confidential, anonymous, and not linked to any personal information. At the end of the project all data will be destroyed. Access to all data will be limited to study personnel. If you have any questions or concerns about your participation in this project, contact: Meredith Dugoni at dugoniml@vcu.edu or 804-828-9095

Your Name: _____

What is your gender?

- Male
 Female
 Other

Since you selected "Other" gender, please use the space provided to explain, if desired.

What is your age?

- Less than 20 years old
 20-30 years old
 31-40 years old
 41-50 years old
 Greater than 50 years old

Please select your race/ethnicity (select all that apply):
(Check all that apply)

- White
 Hispanic or Latino
 Black or African American
 Native American or American Indian
 Asian/Pacific Islander

Please select your level of education:

- Some high school
- High school graduate
- Associates degree
- Some college
- College graduate (bachelor's degree)
- Master's degree
- Professional degree
- Doctoral degree

How many children with age 10-18 do you have?

- 0 children
- 1 child
- 2 children
- 3 children
- 4 or more children

How many children age 19 and older do you have?

- 0 children
- 1 child
- 2 children
- 3 children
- 4 or more children

Have you heard of the human papillomavirus (HPV) or the HPV vaccine?

- Yes
- No

Have any of your children completed the HPV vaccine series?

- Yes
- No

Have any of your children initiated the HPV vaccine series (had at least 1 shot in the series)?

- Yes, and they have completed the series
- Yes, and they will complete the series
- Yes, but they will not complete the series
- No, but they will be starting the series in the next 30 days
- No, but they will be starting the series in the next 6 months
- No, and I have not thought about them starting the HPV vaccine series
- No, and I do not want them to be vaccinated for HPV

Have any of your children visited a pediatrician since the dental visit where you received educational materials on HPV?

- Yes
- No
- Unsure

If so, did the pediatrician or other medical provider recommend the HPV vaccine?

- Yes
- No
- We have not visited the doctor since the last dental visit.

Do you think it is important for female adolescents between the ages of 11-26 to receive the HPV vaccine?

- Yes
- No
- Unsure

Do you think it is important for male adolescents between the ages of 11-26 to receive the HPV vaccine?

- Yes
- No
- Unsure

Does Human Papillomavirus cause cervical cancer?

- Yes
- No
- Unsure

Does Human Papillomavirus cause mouth or throat (oropharyngeal) cancer?

- Yes
- No
- Unsure

Can people spread HPV without knowing it?

- Yes
- No
- Unsure

Is getting HPV preventable by getting the HPV vaccine?

- Yes
- No
- Unsure

Do you remember reading the HPV education materials that were given to you by the pediatric dental office?

- Yes
- No

Vita

Dr. Meredith Dugoni grew up in from Portland, Oregon. She received her Bachelor of Science in Psychology with a minor in music from University of Washington in 2010. She was also a member of the University of Washington women's crew team throughout college. She completed her Doctor of Dental Medicine at Roseman University of Health Sciences in 2015. Meredith will complete her Pediatric Dentistry Residency and Master of Science in Dentistry at Virginia Commonwealth University in June 2017.