

The Understanding and Attitudes of Pediatric Dentists Towards HPV Vaccines

BY

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THESIS

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LIST OF ABBREVIATIONS

AAP	American Academy of Pediatrics
AAPD	American Academy of Pediatric Dentistry
ABPD	American Board of Pediatric Dentistry
ACIP	Advisory Committee on Immunization Practices
ADA	American Dental Association
CDC	Centers for Disease Control and Prevention
CE	Continuing Education
DNA	Deoxyribonucleic Acid
FDA	U.S. Food and Drug Administration
HIV	Human Immunodeficiency Virus
HNSCC	Head and Neck Squamous Cell Carcinoma
HPV	Human Papillomavirus
NCI	National Cancer Institute
NHIS	National Health Interview Survey
NIS	National Immunization Survey
OPC	Oropharyngeal Cancer
OPSCC	Oropharyngeal Squamous Cell Carcinoma
OSCC	Oral Squamous Cell Carcinoma
RNA	Ribonucleic Acid
RRP	Recurrent Respiratory Papillomatosis
SCC	Squamous Cell Carcinoma

ABBREVIATIONS (CONTINUED)

STD Sexually Transmitted Disease

US United States

SUMMARY

Surveys were conducted to investigate to the understanding, attitudes and intentions regarding Human Papillomavirus and HPV vaccinations among pediatric dentists in the United States by mailing 500 surveys to American board certified pediatric dentists. The total response rate for data analysis was 25 percent.

Data analysis revealed that pediatric dentists surveyed were more frequently white females who have graduated in the last decade and in solo practices. Pediatric dentists who treat adolescent patients are not more likely to recommend the HPV vaccination than pediatric dentists who do not treat adolescent patients. Pediatric dentists that had training in oral cancer and HPV were more likely to recommend the HPV vaccination than pediatric dentists who did not receive training in oral cancer and HPV. Finally pediatric dentists' level of involvement in providing HPV vaccine was influenced by self-evaluation of comfort and skill level regarding HPV vaccine, identification with the role of vaccinating and assessment of the vaccine as being beneficial.

These findings suggest that pediatric dentists have adequate knowledge of the HPV vaccine and resources to provide them. They should be provided with adequate training on HPV vaccines to increase their comfort level and skills. Pediatric dentists should be encouraged to be part of the primary care providers to improve HPV vaccination rates by engaging their adolescent patients and parents.

1. INTRODUCTION

1.1 Background Information

Human papillomaviruses (HPV) are a group of 150 closely related viruses mainly infecting keratinocytes of skin and mucous membranes.¹ According to Reiter “It is the most common sexually transmitted infection in the United States.”² In the U.S. seven percent of people have had an oral HPV infection and it begins soon after onset of sexual activity.³ HPV infection is three times more common in men than women. According to the Centers for Disease Control and Prevention (CDC) “63 percent of oropharyngeal cancers (back of throat, base of tongue and tonsils) are caused by HPV types 16 & 18” and the rate of those cancers is increasing in the pediatric population.⁴

The U.S. Food and Drug Administration (FDA) approved two vaccines for use against HPV. In 2006, a quadrivalent HPV vaccine (HPV 4; Gardasil, Merck and Co.Inc.) was approved for use in females ages 9-26 years. In 2009, a bivalent HPV vaccine (Cervarix, GlaxoSmithKline) was approved for use in ages 9-26 years. The Advisory Committee on Immunization Practices (ACIP) recommended “HPV 3-dose vaccination for 11-12 year old females” in the U.S. to ensure protection at an earlier age, prior to sexual debut. The CDC recommends “Catch-up vaccination is recommended for females aged 13-26 years who have not been previously vaccinated.”⁵

There is increased public awareness of the link between HPV and cancers but surveys hint at uneven adoption of HPV cancer vaccine. According to the National Health Interview Survey (NHIS) of HPV vaccine uptake among girls 9 to 17 years old in 2008, only 3% of those 9 to 10 years old, 15% of 11 to 12 year-olds, and 25% of 13 to 17 year-olds received

at least 1 dose of HPV vaccine, while 5.5% of 11 to 12 year-olds and 11% of 13-17 year-olds received all 3 vaccinations.⁶

The American Dental Association (ADA) Council on Scientific Affairs released a statement in January 2013 about the association between HPV and squamous cell cancers of the oropharynx. The statement stressed that dentists should be formally trained to perform intraoral and extra oral soft tissue examinations, and recommended expanded public awareness of the oncogenic potential of some HPV infections and that HPV vaccines be used to reduce the incidence of non-cervical cancers.⁷ According to the NHIS, the most effective measure to reduce HPV transmission is vaccination.⁶ In Illinois, it is required for girls entering sixth grade to get HPV vaccinations unless parents choose exemption. In Illinois, dentists are allowed to administer vaccinations for patients 10 years of age and older. They may administer for influenza, hepatitis B, HPV, and shingles as part of their services to the public.⁸

There have been a number of studies on patient education and awareness of HPV vaccines, the role of HPV in oral cancers and assessment of knowledge of medical health care professionals of HPV.⁹⁻¹³ Yet to date there has not been any published research on evaluating pediatric dentists' role as health care providers in promoting HPV vaccinations.

1.2 Purpose of the Study

To explore pediatric dentists' opinions, knowledge, and perceived barriers and facilitators for HPV vaccination.

1.3 Objective

The aim of this study is to investigate the understanding, attitudes and intentions regarding Human Papillomavirus and HPV vaccinations among pediatric dentists in the United States.

1.4 Hypotheses

H1: Adolescent Patients

Hypothesis: Pediatric dentists who treat adolescent patients are more likely to recommend HPV vaccination than pediatric dentists who do not treat adolescent patients.

H2: Training regarding oral cancer and HPV

Hypothesis: Pediatric dentists that had training in oral cancer and HPV are more likely to recommend HPV vaccination than pediatric dentists who did not receive training in oral cancer and HPV.

H3: Pediatric dentists' level of involvement in providing HPV vaccine will be a function of their:

- a) Knowledge of HPV vaccine
- b) Self-evaluation of comfort and skill level regarding HPV vaccine
- c) Identification with the role of vaccinating
- d) Self-rating of their resources to provide the HPV vaccine
- e) Assessment of the vaccine as being beneficial.

2. REVIEW OF LITERATURE

2.1 Studies about Human Papillomavirus (HPV)

According to CDC “Human Papillomavirus is the most common sexually transmitted disease in the U.S”.⁴ HPV was first discovered in human skin cells in the 1950s.¹⁴ It is a “Group of small, [closed circular], nonenveloped, double stranded DNA viruses belonging to the [papovaviridae] family [with a] predilection for basal cells in the stratified squamous epithelium of the cervix.”¹ Its main mode of transmission is direct skin to skin contact during anal, vaginal and oral sex.¹⁵ It is a group of 150 related viruses mainly infecting epithelial cells of skin and mucous membranes.¹

HPV need a host to survive and replicate, and humans are the only known reservoirs.¹⁵ They may be found embedded into the host genetics, nonembedded, or a combination of the above in epithelial cells of various organisms from animals to humans.¹

HPV hibernate in intraepithelial cells of skin and mucous membranes. The virus is shed off to the surface through the surface epithelial cells and never enters the blood stream or lymphatic system of the host.¹ This elicits a humoral antibody response in the host, but never clears the infection.¹ A cell mediated immune response clears naturally acquired HPV infection through an interaction between viral epitopes and class 1 molecules.¹ Antigen presenting cells, such as Langerhans cells or dendritic cells play important roles in clearing the infection. These cells identify HPV infected cells, thereby stimulating Th1 helper cells, which lead to production of specific cytokines such as cytotoxic T lymphocytes.¹

The significance of a healthy immune system can be appreciated by the fact that over 90% of HPV infections in women are subclinical and are cleared from the human body in 1-2 years.¹ Oral biopsies can be done to check for HPV antibodies to test for past exposure.¹⁶

Over 120 HPV types have been isolated and classified as mucosal/genital and cutaneous types based on their clinical manifestation and sequencing.¹ The mucosal/genital have been further classified as oncogenic (high risk) and nononcogenic (low risk) depending on potential for malignancy.¹

There are over 15 high risk HPV viruses that have the potential to cause dysplastic changes leading to cancer. Twelve low risk HPV viruses may cause genital warts, respiratory papillomatosis or noncancerous mild dysplasia.¹ HPV 16 and 18 are the most common oncogenic viruses followed by HPV 45, which is much rarer. HPV 16 is high risk, and the most carcinogenic, associated with 54% of all cervical cancers.¹

According to studies, the most common risk factor for HPV infection is number of recent/lifetime sexual partners and age of sexual debut.¹ The other, less common, factors are “young age, socioeconomic status, multiparity, male circumcision, condom use, oral contraceptive use, smoking, immune suppression, viral load and [genetics].”¹

2.2 Studies about Human Papillomavirus Causing Cancers

Harald Zur Hausen in 1993 demonstrated the association between HPV infections and cervical cancers.¹ He received a Nobel Prize in Medicine for explaining the role of HPV in carcinogenesis in the uterine cervix.¹⁴ Since then, numerous studies have confirmed the association of HPV as the main causative agent behind anal, esophageal and

oropharyngeal cancers.¹⁷ It is estimated that 5% of all the worldwide cancers are caused by HPV (16 & 18) and these account for 70% of all cervical cancers.¹⁷

In the U.S. alone, “79 million people are currently infected with HPV [and] 14 million people become newly infected each year.”⁴ It is estimated that 75% of adults engaging in sexual activity will be exposed to at least one type of HPV in their life time. It is estimated that, by the age of 50, at least 4 out of 5 women will be infected with at least 1 type of HPV in their life time.⁴

The CDC reported the following statistics for the period 2004-08 based on a registry data from most states which covers 94.8% of the U.S. population. The study showed the 33,300 (21,300 in women and 12,200 in men) HPV-related, incident cancers each year.^{4,18}

TABLE I

CANCER INCIDENCE RATES BY GENDER & SITES		
Gender	Cancer Sites	Cases per year
Women	Cervical	11,967
	Vulva	3,136
	Anal	3,089
	Oropharyngeal	2,370
	Vaginal	729
Men	Oropharyngeal	9,356
	Anal	1,678
	Penile	1,046

* Rates are Per 100,000, Age-adjusted

The study reported the following statistics based on race and ethnicity: HPV associated cervical cancers were more common in black and Hispanic women than white women; HPV associated vaginal cancers were more common in black women than others; HPV associated oropharyngeal cancers were more common among white and black people

than others; and HPV associated penile cancers were more common in Hispanic men than non-Hispanic men.

The study also reported the following cancer rates by state.

- Cervical Carcinoma: Highest in District of Columbia (10.13 cases per 100,000 people), and lowest in Montana (5.33 cases per 100,000 people). Illinois had 8.53 cases per 100,000 people.
- Vulvar Squamous Cell Carcinoma: Highest in Rhode Island (2.88 cases per 100,000 people) and lowest in Arizona (1.18 cases per 100,000 people). Illinois had 1.91 cases per 100,000 people.
- Vaginal Squamous Cell Carcinoma: Tennessee (0.62 cases per 100,000 people). Illinois had 0.41 cases per 100,000 people.
- Penile Squamous Cell Carcinoma: Highest in Rhode Island (1.17 cases per 100,000 people). Illinois had 0.81 cases per 100,000 people.
- Anal Squamous Cell Carcinoma: For males, highest in District of Columbia (3.61 males cases per 100,000 people). Illinois had 1.26 cases per 100,000 people. For females, highest in Alaska (2.62 males cases per 100,000 people), and lowest in Hawaii (0.83 cases per 100,000 people). Illinois had 1.62 cases per 100,000 people.

Oropharyngeal SCC: For males, highest in Florida (8.18 males cases per 100,000 people) and lowest in South Dakota (3.68 cases per 100,000 people). Illinois had 6.39 cases per 100,000 people. For females, highest in District of Columbia (2.07 cases per 100,000 people) and lowest in Utah (0.57 cases per 100,000 people). Illinois had 1.45 cases per 100,000 people.⁴

The study reported the following statistics based on median age at diagnosis: 48 years old for HPV-associated cervical cancer, 66 years old for HPV associated vulvar cancer, 68 years old for HPV associated penile cancers, 69 years old for HPV associated vaginal cancer, 56 years old among men and 60 years old among women for HPV associated anal cancer, 58 years old among men and 61 years old among men HPV associated for oropharyngeal cancer.

HPV can be transmitted sexually and non-sexually. They have been diagnosed in newborns, virgins, infants and children suggesting possible nonsexual transmission.¹⁹⁻⁹

The most common mode of non- sexual HPV transmission are vertical (peri-conceptual transmission, prenatal and perinatal), horizontal (breast feeding, from siblings via kissing, or other household members and friends) and autoinoculation (scratching from one site of the body to another).¹⁹ The “Most common HPV profile was high risk HPV in all family members (29%), followed by HPV-positive mother-infant pairs (26%).”²⁰

The most common pediatric HPV associated infections are skin warts. Cutaneous types persist for a long time. They have peak prevalence between 10-14 years and decline by age 20 years with hair follicles acting as a reservoir. Skin warts are associated with failure of immunity and increased susceptibility to genital HPV lesions. “Oral papilloma’s are the most common epithelial [tumors] of oral mucosa in children.” They are associated with HPV 6 or HPV 11.” Recurrent respiratory papillomatosis (RRP) can be juvenile (before 5 years of age) or adult onset (20-40 years). RRP can grow in size causing total respiratory obstruction. Malignant transformation to carcinoma has been seen in 3-5% of cases.¹⁹

2.3 Studies about Human Papillomavirus Causing Oropharyngeal Cancer

Human Papillomavirus causes “Head and neck squamous cell carcinoma (HNSCC) which includes cancers of oral cavity, [oropharynx], and larynx.”^{21,22} HNSCC “are the sixth most common cancers worldwide with an estimated 633,000 cases [per year] and 355,000 deaths [per year]”.^{21,22} The first cancer widely recognized to be caused by HPV was cervical cancer with an estimated 492,800 cases each year.^{21,22} In 1983 research confirmed for the first time that HPV causes a subgroup of oral and laryngeal cancers.²³ A meta-analysis reported that over 90% of oropharyngeal cancers (OPC) with approximately 30,000 cases each year are caused by HPV 16/18.²⁴ HPV- positive oral squamous cell carcinoma (OSCC) has been recognized as a separate entity and considered an epidemic.²⁵

The incidence of HPV-positive oropharyngeal cancers (OPC) increased significantly from 1988-2002 in economically developed countries. This is true in both men and women and in younger ages.^{14,26} In the United States alone there was approximately 60%-70% increase in HPV- positive OSCC compared to less than 10% in less economically developed countries.²⁶

There has been an increase in the number of reported HPV associated cases. In 1980, only 26% of the reported OSCC were identified as HPV positive. In 2000, 73% OSCC cancers reported were HPV positive.²⁵ In the current literature, it has been suggested that at any given time HPV-positive oral/oropharyngeal infections can be found in 7% of the population aged 14-69 years in the U.S.¹⁴

The number of HPV–positive OSCC diagnosed worldwide from 1988-2004 was 22,000 cases. During the same period there was a 225% population level increase in HPV – positive OSCC in the United States (from 0.8 cases per 100,000 individuals in 1988 to 2.6 cases per 100,000 in 2004).¹⁴ The number of HPV-positive OSCC increased from 16.3% from 1984-89 to over 70% in 2000-04 in the U.S.²² There was a 50% decrease in HPV-negative OSCC during the same period.¹⁴

It has been reported that by 2020, the incidence of HPV-positive OSCC will be greater than the incidence of cervical cancer and by 2030 half of all the head and neck cancers will be caused by HPV.¹⁴ The role of age and sex has been very consistent with HPV infections in the literature.^{22,27}

The prevalence of HPV 16 is the most common of all HPV, over 5 times more common than all other subtypes combined. HPV infections are not evenly distributed across age groups but are actually bimodal with age.²⁷ OSCC are not all associated with HPV.

Alcohol and smoking are two modifiable risk factors that account for over 75% of OSCC incidence.²⁸ HPV-positive HNSCC are less likely to have a history of tobacco exposure and the etiology of HPV 16 related OSCC is different from that of HPV- negative OSCC.²⁸

The most common profile of HPV- positive OSCC is white, middle aged males of moderate to upper income who have had multiple oral sexual partners.¹⁴ HPV-positive OSCC have a better prognosis compared to HPV-negative OSCC.^{14,22} The probable reasons are high susceptibility of HPV to radiation treatment and fewer secondary malignancies.¹⁴ A meta-analysis of available literature suggests that patients with HPV- positive OSCC have 20 to

80% reduction in risk of death and 49% reduction in risk of disease recurrence compared to HPV-negative OSCC.^{14,22,29}

The most common clinical presentation of HPV-positive patients is small primary tumors with extensive nodal disease.^{21,22} HPV DNA has gene expression profile and up regulate p16 marker which is exclusively found in HPV-positive OSCC. The most common detection methods used to diagnose HPV are polymerase chain reaction (PCR), DNA in situ hybridization, p16 immunohistochemistry and southern blot (previously the gold standard, but no longer used).^{23,29}

2.4 Studies about Human Papillomavirus Vaccine

According to the CDC the annual cost of treating STDs in the U.S for patients and insurance companies is \$15.6 billion over the course of the infections.³⁰ The “Estimated lifetime total medical cost of HPV infection for men and women aged 15–24 is \$2.9 billion, which makes HPV the second most expensive STD after HIV.”³⁰

Health education measures about safe sex with the use of condoms, reduction of sexual partners and prophylactic vaccination, are some of the recommendations to reduce HPV transmission.³¹ According to research, the best prevention strategy for HPV related infections is prophylactic vaccinations.

HPV vaccine is also recommended for men aged “22 through 26 years [if they] have not been immunized [in the past] or have not completed the series.” It is deemed to be safe in “[immunocompromised patients], lactating women, patients with minor acute illnesses, such as diarrhea or mild upper respiratory tract infections, women who have had abnormal Pap test, positive HPV test or genital warts, [and children with special health care

needs].”³² HPV vaccines should be avoided in pregnant women and people with a history of immediate hypersensitivity to yeast.⁵

The American Academy of Pediatrics (AAP) explained the rationale for HPV immunizations at “11- 12 years of age as twofold. Optimal vaccine efficacy is achieved if it is administered before onset of sexual activity”. Also, antibody responses are highest at ages 9 through 15 years.⁵ Antibody levels induced by HPV vaccines are 100 times higher than the antibody levels induced by natural HPV infections. The bivalent vaccine-induced antibody levels remain very high for 8.4 years compared to quadrivalent vaccine antibody levels which decreased in 3-5 years similar to the levels of natural infections induced HPV 18 antibodies.³³

According to the Vaccine Adverse Events Reporting System, 57 million doses of HPV vaccine have been distributed by 2013.³⁴ The most common reported side effects of HPV vaccine are syncope, nausea, headache, dizziness, local pain and redness.³⁴ ACIP recommends that clinicians should observe patients for 15 minutes after vaccination.³⁴

“The duration of prophylactic HPV vaccine efficacy is now approaching 10 years.”³³

According to several studies reported by CDC, the vaccine efficacy is very good (>90%).³³

The bivalent vaccine in females has 96% efficacy for HPV 16 and 86.7% efficacy for HPV 18, compared to quadrivalent vaccine efficacy of 98% and 100% for the same infections.³³

HPV vaccine is covered by most private health insurance companies, government insurance programs and also under the Affordable Care and Patient Protection

Act.^{5,11,31,33-38}

2.5 Studies about Human Papillomavirus Vaccination Uptake in the United States.

According to data from the National Immunization Survey (NIS), the percentage of HPV vaccination “in girls’ age 13-17 years who received one dose increased from 25.1% in 2007 to 53% in 2011.”³⁹ The percentage of girls who received all three doses during the same period dropped from 35% in 2011 to 33.4% in 2012.^{6,39,40} In 2011, only 8.3% of U.S. males aged 13-17 years had initiated HPV vaccine. The vaccine coverage numbers are not encouraging in the U.S. compared to greater than 80% HPV vaccine coverage in United Kingdom, Australia, and even Rwanda.

A “missed health care encounter” was defined as “health care encounter occurring on or after girls 11th birthday and on or after March 2003 (ACIP recommendation date for HPV vaccination), during which a girl received at least one vaccine but did not receive an HPV vaccine.”⁴⁰ According to NIS, “the percentage of girls with at least one missed opportunity for HPV vaccination increased from 20.8% in 2007 to 84% in 2012”.⁴⁰ It is possible to achieve 92.6% of HPV vaccination coverage with greater than or equal to one dose of HPV vaccine if these missed opportunities are eliminated.⁴⁰

According to data from National Health and Nutrition Examination Surveys:

In female’s age 14-19 years, vaccine-type HPV prevalence declined from 11% before the recommendation for vaccination (2003-06) to 5% after (2007-10). The prevalence did not differ significantly between the two time periods in other age groups. The results of this study indicate a vaccine effectiveness of at least one dose of 82%, sufficient to reduce HPV carriage despite a low uptake.”⁴⁰

According to Thomas Friedan, Director of the CDC, of which ACIP is a branch, “53,000 cases of cervical cancer [can] be prevented over the [lifetime] of those aged less than or equal to 12 years by completing a three dose regimen of HPV vaccination”. This could also prevent 4,400 new cervical cancer cases and 1,400 deaths in women every year.

“One-time dosing rates [in women] are declining and have been hovering [around] 25% for the [past] 2 years.”⁴¹ The reasons associated with completion and one time dosing are similar. African-Americans, Hispanics and individuals with public insurance are associated with reduced series completion and one-time dosing.⁴¹ “Pediatric clinics had the highest completion rates (61%) followed by family medicine (53%).”⁴¹

According to CDC “Compared with whites, HPV vaccination coverage rates for Hispanics were higher (one and two doses of vaccine among females and all three doses among males). [Among males, coverage was higher (one and two doses HPV vaccine)] for blacks compared with whites, but 3-dose series completion was lower among [blacks]. [Among] females, HPV vaccine series completion was lower for Hispanics and blacks compared with whites.”⁴

According to CDC “Among females, coverage for ≥ 1 HPV vaccine dose varied from [40% in] Florida to [74% in] Rhode Island. For ≥ 3 HPV vaccine doses, [coverage ranged] from 12% in Mississippi to [58% in] Rhode Island. Among males, coverage for ≥ 1 HPV vaccine dose ranged from 11% in Wyoming to 55% in Rhode Island. Regionally, vaccination coverage was highest overall in the Northeast. Among males, vaccination coverage estimates for each HPV vaccine series dose and HPV series completion were similar across regions.”⁴

The objective of “Healthy people 2020” is to increase HPV vaccination completion to 80% in females aged 13-15 years. This would reduce HPV associated infections in females and their sexual partners.³⁹

2.6 Studies about Parent’s and Patient’s Perception about Human Papillomavirus Vaccine.

The vaccination coverage has not reached desirable levels compared to other vaccine uptake in U.S. Several studies were done to understand parents’ knowledge, attitude, and HPV vaccine acceptance.

A telephonic survey was conducted in North Carolina to assess HPV vaccine awareness and information sources. It was found that “91% of parents had heard HPV vaccine [and] parents were more [likely] to be aware [of the vaccine] if the household [income was] \$50,000 or higher, [if the parent] had non- Hispanic white daughters or daughters vaccinated meningitis.” The study has also found that the most common sources of information for parents are drug company advertisements (64%), health care providers (50%) and schools (9%).^{2,39,42,43} The study concluded that health care providers are the most important source of HPV information for parents for HPV vaccine initiation.^{2,39,42,43}

A systematic review of literature was done by CDC to evaluate the barriers preventing HPV vaccination among US adolescents.³⁹ The following results were found as key barriers in order faced by the parents.^{2,39,42,43}

- Recommendations not provided by health care professionals on HPV vaccine
- Inadequate information
- Beliefs that child is too young

- Safety concerns
- Cost
- Concerns about finding a clinic that delivers HPV vaccine.

In underserved and disadvantage populations' key barriers faced by the parents to HPV vaccination among US adolescents in order are limited knowledge about HPV and HPV vaccine, lack of insurance coverage, recommendations not provided by health care professionals, lack of trust in health care system, cultural factors, and immigration status.^{2,39,42,43}

Barriers faced by parents to HPV vaccination among US adolescent males in order are: lack of perceived benefit or need to vaccinate males, lack of awareness that males can be vaccinated, recommendations not provided by health care professionals, and the cost of the vaccine.³⁹

The HPV² Immunization in Sons study surveyed parents and their 11-17year old sons to examine attitudes and beliefs about HPV vaccination for males.” The study showed only “[2% of the] sons had received any doses of HPV vaccine [and] of [that] only 2% had received all 3 doses. Parents were more willing to get their sons free vaccine if they had more liberal political views, perceived higher likelihood of sons getting HPV related disease, had daughters who had received HPV vaccine, or were more comfortable talking with their sons about new vaccines.” Among unvaccinated sons who completed surveys, 75% never heard of HPV before, 16% had high knowledge about HPV and 10% were aware but had low knowledge about the vaccine. “Sons’ willingness to get vaccinated was positively correlated with their parents’ willingness to get them free HPV vaccine.”²

Barriers faced by the parents to completion of 3 dose HPV vaccination series among US adolescents are as follows.

- Lack of insurance coverage
- Lack of regular medical home
- Recommendations not provided by health care professionals
- Little contact with medical system
- Unaware or forgetting about the need for additional doses.^{2,39,42,43}

Studies also highlight a few relevant findings associated with parents' role in vaccination.

In a qualitative study among African Americans and Haitian immigrants, parent's reported concerns about vaccinations interpreted as condoning sexual activity but also appreciation for protections provided by vaccine. Young age of the child was the reason delaying or refusing vaccine and older girls were more likely to be vaccinated than younger girls.

Vaccine acceptance by parents was also associated with social norms. Parents' history of seeking preventive care for themselves or their children was positively associated with HPV vaccine acceptance. Mothers with a history of HPV- related infections were more likely to vaccinate their daughters. Certain religious affiliations were associated with opposition or nonreceipt of HPV vaccine. A qualitative study found that black women have limited knowledge and confusion about HPV and the vaccine.^{2,39,42,43}

According to data from NIS 2011,¹⁸ the top 5 reasons for not vaccinating adolescent daughter's among parents with no intentions to vaccinate in next 12 months are:

- Not needed or not necessary (23%)
- Not sexually active (19%)

- Safety concerns/side effects (15%)
- Lack of knowledge (15%)
- Not recommended by provider (10%).

According to a survey of parents of 11-17 year old boys and girls who did not receive HPV vaccine, 84% of girls and 79% of boys had preventive care visits in the last 12 months.

This data suggest that adolescents are getting vaccinated for other preventable disease but not for HPV. In the U.S. 85% of “adolescents received Tdap [vaccine] in 2012, but only 50% of the girls and 20% of boys received their [initial] HPV vaccine [dose during the same time].⁴⁴ According to NIS, “The percentage of girls with at least one missed opportunity for HPV vaccination increased from 20.8% in 2007 to 84% in 2012”. It’s possible to achieve 92.6% of HPV vaccination coverage with greater or equal to 1 dose of HPV vaccine if these missed opportunities are eliminated.⁴⁴

In summary, “Parents play a very important role in vaccination behaviors of their adolescent daughters. Their beliefs about HPV vaccination are important for vaccine initiation.”^{42,43}

2.7 Studies about Health Care Provider’s Perception about Human Papillomavirus

Vaccine

According to the President’s Cancer Panel Annual Rate Report 2012-2013, Accelerating HPV Vaccine Uptake, physicians’ recommendation to parents is the most important factor for increasing HPV vaccination uptake in adolescents.⁴⁴

A study of provider perceptions of parents’ attitudes towards HPV vaccination identified factors that help facilitate offering HPV vaccination. These relate to provider attitudes and

intent to prevent “cervical cancer and HPV related disease, knowledge about or experience with these diseases, and [recommendations] of professional societies.”⁴⁵

Another study found that pediatricians are generally more supportive (99%) of HPV vaccinations, compared to other health care providers and generally would recommend (88%) HPV vaccines to their patients meeting ACIP and AAP guidelines.^{12,13} They were also more likely to recommended HPV vaccinations without parental permission compared to other health care providers.^{12,13}

Another qualitative study of interviews with pediatricians showed that, when parents expressed reluctance, providers were hesitant to engage in discussion. Also, some perceived the vaccine as less important than other vaccines. Some providers shared parent views that their teen was not at risk and could delay vaccination until older.¹³

A qualitative review of 184 health care encounters where HPV vaccination was discussed found that HPV vaccine is presented as optional. Some expressed mixed/negative opinions about the vaccine.⁴⁶

Providers have reported several key barriers to HPV vaccination among US adolescents. These include financial concerns,⁴⁵ parents’ attitudes and concerns,⁴⁵ knowledge gaps, inadequate insurance coverage and reimbursements,⁴⁷ preference for vaccinating older vs younger adolescents, preference for vaccinating girls vs boys, the complex and time consuming nature of discussing the vaccinations,⁴⁸ poor public understanding of HPV,⁴⁸ parental concerns that result in delayed and missed vaccinations,⁴⁸ and concerns parents will not return for follow up injections.⁴⁸ White, middle- class parents may be more likely to

defer vaccination due to safety concerns or sexual issues compared to immigrants from low resource settings.⁴⁸

Other factors are positively associated with vaccination. These include safety of the vaccine, benefit to the patient, “structured visits that promote vaccination, and co-administration of other vaccines. Factors [impeding] vaccination [include] safety of [vaccines], low severity of HPV disease, lack of school [mandate], policies against coadministration of HPV [vaccines] and meningococcal vaccines. Provider perceptions of the ease or difficulty of providing HPV vaccination may influence their behavior.”⁴⁵

Most of the studies emphasize that primary care providers can play a very important role in increasing vaccination coverage by strongly recommending the vaccine, not delaying the vaccine, implementing evidence-based strategies to improve vaccine delivery and avoiding missed opportunities.¹⁸

2.8 Studies about Dentist’s Perceptions about Human Papillomavirus Vaccine.

According to an exploratory study of Florida dentists to assess stages of readiness to discuss HPV vaccine with females, the majority of participants identified themselves as at the precontemplation (52%) or contemplation (40%) stage. Only 8% of dentists were currently discussing HPV vaccine with their female patients. The most common barriers identified by dentists in precontemplation stage are not enough information about the vaccine, concern about safety of the vaccine, and liability, which was the most important factor noted. In addition, dentists indicted that it is not their role as oral health care providers, and pointed to the lack of professional guidelines from the ADA. In addition, some said that appointments not long enough, and expressed discomfort discussing sex

with patients. Dentists who reported professional journals, oral health colleagues and continuing education courses as sources of HPV vaccine related information were more likely to be in the contemplation stage.⁴⁹

In another report by the same team, dentists and dental hygienists were found to have limited knowledge about HPV, HPV's association to oral cancer, and the HPV vaccine. The study also found that dentists and dental hygienists felt uncomfortable discussing HPV and its link to oral cancer with patients and also felt concerned about confidentiality issues. Oral health care providers varied in their role in discussing HPV-OC and HPV vaccines with their patients.⁵⁰ The researchers concluded that a majority of dentists are not actively participating in primary prevention behavior. The authors recommended preparing dentists for sensitive conversations with patients of both sexes and actively involving the ADA in providing professional guidelines.⁴⁹

The study recommends three strategies to increase knowledge and role clarification:⁵⁰

- Policy guidelines from professional organizations (ADA) to address the HPV- OC link and effectiveness of HPV vaccines;
- Continuing education for providers;
- Clinical, hands-on training for HPV – OC screening and communication techniques for oral health care providers.

Studies have confirmed that dentists have concerns discussing sensitive topics with patients of the opposite sex. Especially male dentists felt greater discomfort in discussing HPV with female patients. Some feel that it's not their role as health providers to discuss

HPV and these topics should be handled by family practitioners and gynecologists due to the sexual component.

2.9 Studies about Pediatric Dentists perception of Human Papillomavirus Vaccine

There has been not been any published study to date discussing the role of pediatric dentists in HPV vaccination. The present study aims to do so.

3. MATERIALS AND METHODS

3.1 Study Design and Procedures

This study was conducted by mailing surveys to “Members of the College of Diplomates of the American Board of Pediatric Dentistry (ABPD)”. The sample was derived from randomly selecting 500 members from the College of Diplomates of the American Board of Pediatric Dentistry. A cover letter was mailed along with all surveys and a preaddressed stamped return envelope was included. The survey and cover letter are found in Appendices A and B respectively. The questionnaire contained questions regarding demographics, educational experiences and the practitioner’s understanding and attitude towards HPV vaccination.

The survey was anonymous and no identifiers were collected. The questionnaire consisted of five pages. The first page was the cover letter explaining the purpose of the study, the anonymity of the respondents, and identifying the researchers involved (Appendix A). The second page included questions about demographics. The third page included questions about the subjects’ practices regarding adolescent patients and HPV. The fourth page included questions about the subjects’ beliefs regarding HPV vaccine, and the fifth page included questions about subjects’ level of involvement regarding HPV vaccine. (Appendix B)

3.2 Theoretical structure

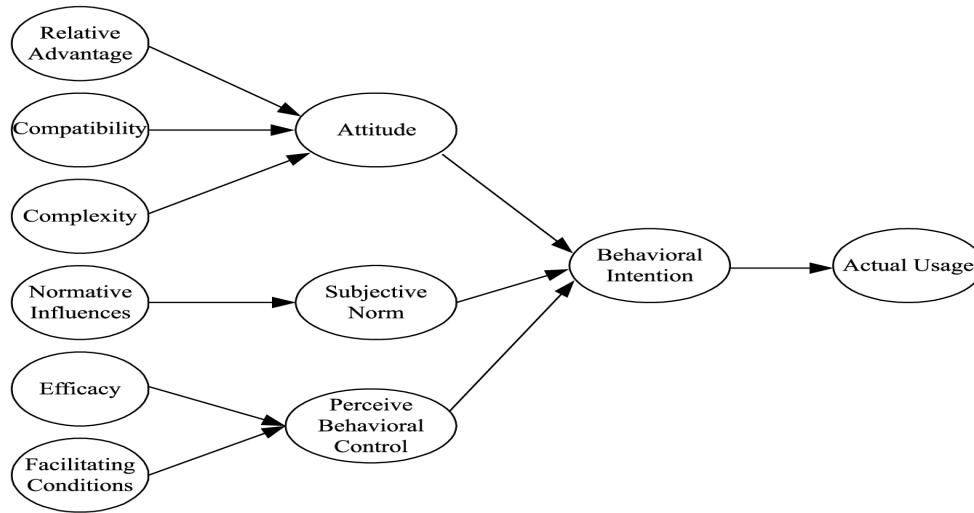


Figure 1: Theory of Planned Behavior

The study is based on the Theory of Planned Behavior.⁵² According to this theory, behavior is a function of intentions towards a behavior and is modified by three factors:

1) Perceived behavioral control is defined as the degree to which the behavior is under one's control. In this study this is measured as beliefs about HPV vaccination which may facilitate or inhibit performance by the pediatric dentist.

2) Subjective norms are defined as perceptions of social norms regarding the behavior. These norms are based on beliefs of significant others (e.g. friends, peer, family, dentists) regarding the behavior. These norms mainly influence the motivation to comply with the behavior.

3) Attitudes are defined as the positive or negative evaluations of the expected outcome of the behavior. In this study, the attitudes of interest are expectations about HPV vaccination effects on the health of adolescent patients.

3.3 Data Management: Data was coded without personal identifiers and entered into password protected computer files. Data was analyzed using SPSS version 20.0 (Armonk, New York) for statistical analysis.

3.4 Statistical Analysis: The analysis was done using Mann- Whitney U, Spearman's rho and linear regression. A new variable, level of involvement, was created in SPSS by adding scaled measures of pediatric dentists' expressed willingness to refer, deliver, or administer the HPV vaccine.

3.5 IRB Approval: The study was approved by the UIC Institutional Review Board.
(Appendix C & D)

4. RESULTS

4.1 Number of Respondents and Response Rates

After data collection was complete, a total of 126 surveys were received. The final response rate was 126 out of 500 (25%).

4.2 Demographic Characteristics of Pediatric Dentists Responding to HPV Questionnaire

The demographic characteristics of sample pediatric dentists' are listed in Table II. The majority of the respondents were white. Most of the respondents surveyed have graduated in the last 10 years and are solo practitioners. More women responded than men. The majority of subjects reported seeing at less than 25 adolescents a week, but many reported seeing up to 50 per week. Similarly, most reported adolescents constituted less than 25% of their practices, but many reported seeing up to 50% of adolescents. Far more respondents reported taking a CE course on oral cancer than HPV.

TABLE II**DEMOGRAPHIC CHARACTERISTICS OF PEDIATRIC DENTISTS RESPONDING TO HPV QUESTIONNAIRE**

Demographics	Frequency Sample Size (n=126)	Percentage
Gender		
Male	54	43%
Female	72	57%
Ethnicity		
Caucasian/White	82	65%
Asian	21	17%
Hispanic	7	6%
Others	16	13%
Year of graduation from Pediatric residency		
1975 - 1984	12	10%
1985 - 1994	28	22%
1995 - 2004	34	27%
2004 - 2014	52	41%
Employment Status		
Solo practitioner	44	35%
Partner in group practice	31	25%
Associate	20	16%
Academics	11	9%
Employee in group practice	10	8%
Others	10	6%
Number of adolescent patients in a regular week (n= 125)		
0 – 25	59	47%
26 - 50	38	30%
51 - 100	19	15%
100 - 300	9	7%
Percentage of adolescent patients in a regular week.		
0 – 25%	86	68%
26- 50%	37	29%
51- 75%	3	2%
Continuing education (CE) course on oral cancer		
Yes (Year of CE course, Mean = 2010, SD = 4)	66	52%
No	60	48%
Continuing education (CE) course on HPV		
Yes (Year of CE course, Mean = 2012, SD = 2)	25	20%
No	101	80%

4.3 Pediatric Dentists' Practices Regarding Adolescents and HPV

Table III represents pediatric dentists' practices regarding adolescents and HPV. The majority of the pediatric dentists' respondents did not discuss oral cancer and its risk factors with their adolescent patients. The majority of pediatric dentists reported allowing parents to accompany their adolescent patients during patient education. However, most respondents did not provide verbal counselling on HPV vaccinations to prevent oral cancer or provide any health related brochures in their clinical practice for HPV-associated oral cancers or HPV vaccinations to prevent oral and cervical cancers caused by HPV. Almost all pediatric dentists reported enquiring about the immunization status of their adolescent patients at least sometimes. More than half said they do so most of the time.

TABLE III

PEDIATRIC DENTISTS PRACTICES REGARDING ADOLESCENTS & HPV

Descriptions	Frequency Sample Size (n=126)	Percentage
Percentage of adolescent patients counselled about oral cancer and its risk factors.		
0 – 5%	96	76
6 – 10%	14	11
11 – 50%	12	10
51 – 100%	4	3
Percentage of parents accompanying their adolescent children for patient education.		
0 – 5%	17	14
6 – 10%	3	2
11 – 50%	11	9
51 – 100%	95	75
Percentage of adolescent patients enquired about immunization status.		
0 – 50%	68	54
51 – 100%	58	46
Health related brochures given for the following topics		
<i>1) HPV associated oral cancer.</i>		
Yes	6	3
No	94	97
<i>2) HPV vaccinations to prevent oral and cervical cancers caused by HPV.</i>		
Yes	4	3
No	122	97
Percentage of adolescent patients provided verbal counselling on HPV vaccinations to prevent oral cancer(n- 125).		
0 – 5%	113	90
6 – 10%	4	3
11 – 50%	5	4
51 – 100%	3	2

4.4 Pediatric Dentists' Level of Knowledge Regarding HPV Infections and HPV Vaccination

Table IV describes pediatric dentists' level of knowledge regarding HPV infections and HPV vaccination. The majority of responding pediatric dentists reported that HPV infections cause cervical, oropharyngeal and genital cancers. However, just only half of the respondents reported that HPV causes anal cancer. The majority of respondents reported that the recommended age group for HPV vaccine by the American Committee on Immunization Practices (ACIP) is 9-11 years. The majority of respondents reported that insurance companies do not pay for HPV vaccination. They believe that most states do not require girls entering sixth grade (age 11 years) to get HPV vaccination.

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TABLE IV

**PEDIATRIC DENTISTS LEVEL OF KNOWLEDGE REGARDING HPV INFECTIONS &
HPV VACCINATION**

Descriptions	Frequency Sample Size (n=126)	Percentage
HPV causes cervical cancer		
Yes	115	91%
No	11	9%
HPV causes genital warts		
Yes	104	83%
No	22	17%
HPV causes anal cancer		
Yes	69	55%
No	57	45%
HPV causes oral cancer		
Yes	100	80%
No	26	20%
Recommended age group for HPV vaccine by American Committee on Immunization Practices (ACIP) is 9-11 years		
True	78	62%
Note true	48	38%
Most states require girls entering sixth grade (age 11 years) to get HPV vaccination unless their parents choose to exempt		
True	36	29%
Note true	90	71%
Insurance companies usually provide coverage for HPV vaccination		
True	51	40%
Note true	75	60%

4.5 Pediatric Dentists' Intentions Regarding HPV Vaccine

Table V describes pediatric dentists' intentions regarding HPV vaccine. The majority of the pediatric dentists believe that HPV vaccination is safe and prevents all HPV related infections in their adolescent patients. The respondents seem to be evenly split on the role of pediatric dentists in providing HPV vaccination counselling to adolescent patients. Most of the pediatric dentists responded that they lack adequate skills and resources to provide HPV vaccination to their adolescent patients.

TABLE V

PEDIATRIC DENTISTS INTENTIONS REGARDING HPV VACCINE

Descriptions	Frequency Sample Size (n=126)	Percentage
I believe HPV vaccination could prevent some or all these diseases (Mean = 2.6, SD= 0.7), n= 125		
Agree	88	70%
Neutral	23	18%
Disagree	14	11%
I believe HPV vaccinations are safe in adolescent patients. (Mean = 2.6, SD= 0.6)		
Agree	81	64%
Neutral	35	28%
Disagree	10	8%
I think its fits in the role of pediatric dentist to provide HPV vaccination counselling to adolescent patients. (Mean = 2.0, SD= 0.8)		
Agree	40	32%
Neutral	43	34%
Disagree	43	34%
I have the resources I need to provide HPV vaccinations to adolescent patients. (Mean = 1.2, SD= 0.6)		
Agree	8	6%
Neutral	16	13%
Disagree	102	81%
I have the skills needed to provide HPV vaccinations to adolescent patients. (Mean = 1.6, SD= 0.9)		
Agree	35	28%
Neutral	13	10%
Disagree	78	62%

Note: The original responses were on a 5 point Likert scale, 1 = Strongly disagree, 2 = Disagree, 3 = Neither agree nor disagree, 4 = Agree and 5 = Strongly agree. The responses were recoded as follows: 1= Agree (Strongly agree + Agree), 2= Neutral and 3= Disagree (Strongly disagree + disagree). The means are based on the 5 point scale.

4.6 Pediatric Dentists' Beliefs Regarding HPV Vaccine

Table VI describes pediatric dentists' beliefs regarding HPV vaccine. The majority of respondents reported that they are not religiously opposed to counselling their patients for HPV vaccination and believe HPV vaccination will benefit the health of the adolescent patient. The majority of the pediatric dentists reported that they lack adequate counseling skills and over half of the respondents are not comfortable discussing HPV vaccinations with their adolescent patients and parents.

TABLE VI

PEDIATRIC DENTISTS BELIEFS REGARDING HPV VACCINE

Descriptions	Frequency Sample Size (n=126)	Percentage
I think recommending HPV vaccinations would enhance the health of my adolescent patients. (Mean = 3.8, SD= 0.8)		
Agree	71	56%
Neutral	46	37%
Disagree	9	7%
I am religiously opposed to counselling for HPV vaccinations with my patients. (Mean = 1.2, SD= 0.5)		
Agree	3	2%
Neutral	23	18%
Disagree	100	80%
I have adequate counselling skills to discuss HPV vaccinations with my patients and parents. (Mean = 1.6, SD= 0.8)		
Agree	30	24%
Neutral	17	13%
Disagree	79	63%
I am comfortable discussing HPV vaccinations with adolescent patients and parents. (Mean = 1.7, SD= 0.9)		
Agree	39	31%
Neutral	16	13%
Disagree	71	56%

Note: The original responses were on a 5 point Likert scale, 1 = Strongly disagree, 2 = Disagree, 3 = Neither agree nor disagree, 4 = Agree and 5 = Strongly agree. The responses were recoded as follows: 1= Agree (Strongly agree + Agree), 2= Neutral and 3= Disagree (Strongly disagree + disagree). The means are based on the 5 point scale.

4.7 Pediatric Dentists' Level of Involvement Regarding HPV Vaccine

Table VII describes the pediatric dentists' level of involvement regarding HPV vaccine.

Most of the respondents said that they would not deliver or administer the HPV vaccine in their office even if they were adequately reimbursed. The majority of pediatric dentists responded that they would actively recommend the HPV vaccine and refer their adolescent patients to their pediatrician for HPV vaccination

TABLE VII

PEDIATRIC DENTISTS LEVEL OF INVOLVEMENT REGARDING HPV VACCINE

Description	Frequency Sample Size (n=125)	Percentage
I would deliver HPV vaccination to patients if I am adequately reimbursed. (Mean = 1.7, SD= 0.9)		
Agree	35	28
Neutral	22	17
Disagree	68	54
I plan on administering the vaccination in my office. (Mean = 1.3, SD= 0.6)		
Agree	7	6
Neutral	28	22
Disagree	90	71
I plan on referring my patients to their pediatrician regarding HPV vaccination. (Mean = 2.7, SD= 0.6)		
Agree	92	73
Neutral	25	20
Disagree	8	6
I do not plan on recommending the HPV vaccination or referring my patients to their pediatrician for HPV vaccination. (Mean = 2.4, SD= 0.7)		
Agree	19	15
Neutral	38	30
Disagree	68	54

Note: The original responses were on a 5 point Likert scale, 1 = Strongly disagree, 2 = Disagree, 3 = Neither agree nor disagree, 4 = Agree and 5 = Strongly agree. The responses were recoded as follows: 1= Agree (Strongly agree + Agree), 2= Neutral and 3= Disagree (Strongly disagree + disagree). The means are based on the 5 point scale.

4.8 Hypothesis 1 – Adolescent patients

Hypothesis 1: Pediatric dentists who treat adolescent patients are more likely to recommend the HPV vaccination than pediatric dentists who do not treat adolescent patients.

1A - Pediatric dentists who treat adolescent patients are more likely to refer patients to a pediatrician for HPV vaccination than pediatric dentists who do not treat adolescent patients.

1B - Pediatric dentists who treat adolescent patients are more likely to deliver the HPV vaccination than pediatric dentists who do not treat adolescent patients.

Table VIII shows the analysis of hypothesis 1. The correlation between two variables was analyzed using Spearman's rho. The correlation showed no significance and the hypothesis is not supported. The null hypothesis is retained.

TABLE VIII

**CORRELATION BETWEEN PROPORTIONS OF ADOLESCENT PATIENTS &
WILLINGNESS TO DELIVER THE HPV VACCINE**

Description		Refer patients to pediatrician for HPV vaccination	No referral or recommendation for HPV vaccination	Deliver the Vaccine
Number of adolescents patients (N=124)	Correlation Coefficient	0.08	0.17	0.02
	Sig.	0.4	0.057	0.8
Percentage of adolescent patients (N=125)	Correlation Coefficient	0.07	0.12	0.1
	Sig.	0.4	0.2	0.2

* Spearman's rho test.

4.9 Hypothesis 2 – Continuing Education (CE) courses on Oral Cancer and HPV

Hypothesis 2: Pediatric dentists who had training in oral cancer and HPV are more likely to recommend the HPV vaccination than pediatric dentists who did not receive training in oral cancer and HPV.

Tables IX and X represent the analysis of hypothesis 2. The hypothesis was tested using Chi-Square. The results were not significant for either CE courses taken in Oral cancer ($P = 0.81$) or HPV ($P = 0.41$) and the hypothesis is not supported. The null hypothesis is accepted and the alternative hypothesis is rejected.

TABLE IX

RELATION BETWEEN CONTINUING EDUCATION (CE) COURSES IN HPV & WILLINGNESS TO DELIVER THE HPV VACCINE

		CE Courses on HPV		Total
		Yes	No	
Refer patients to pediatrician for HPV vaccination (N=125)	Agree	20	72	92
	Disagree	5	28	33

Chi-Square (1df) = .659, p = 0.417

TABLE X

RELATION BETWEEN CONTINUING EDUCATION (CE) COURSES IN ORAL CANCER & WILLINGNESS TO DELIVER THE HPV VACCINE

		CE Courses on Oral Cancer		Total
		Yes	No	
Refer patients to pediatrician for HPV vaccination (N=125)	Agree	48	44	92
	Disagree	18	15	33

Chi-Square (1df) = 0.055, p = 0.81

4.10 Hypothesis 3 – Level of Involvement

Hypothesis 3: Pediatric dentists' level of involvement in providing HPV vaccine will be a function of their 1) knowledge of HPV vaccine, 2) self-evaluation of comfort and skill level regarding HPV vaccine, 3) identification with the role of vaccinating, 4) self-rating of their resources to provide the HPV vaccine, and 5) assessment of the vaccine as being beneficial.

Table XI represents analysis of hypothesis 3. It was hypothesized, following the theory of planned behavior that these five variables would correlate with the level of involvement.

All the variables were entered into a regression equation, then the non-significant

variables were eliminated to produce the final model. The model is described in Table XI. The final model had an R squared of 0.45, indicating three retained variables predict 45% of the variance of level of involvement with HPV vaccine. The final hypothesis was: pediatric dentists' level of involvement in providing HPV vaccine was a function of their self-evaluation of comfort and skill level regarding HPV vaccine, identification with the role of vaccinating, and assessment of the vaccine as being beneficial. Resources and knowledge did not influence level of involvement.

TABLE XI

RESULTS OF REGRESSION ANALYSIS OF SKILLS, BELIEFS & ROLE OF PEDIATRIC DENTISTS IN PRACTISING INVOLVEMENT IN HPV VACCINATION

Model	Standardized Coefficients	t	Sig.
Constant	Beta	-.089	.9
HPV vaccinations enhance health*	0.29	3.43	.001
Comfort level to provide HPV vaccine*	0.24	2.20	.03
Role of pediatric dentist in counselling on HPV vaccination*	0.33	3.57	.001

N= 126

R Square =0.45

ANOVA= Overall model was significant, F = 13.16, P = 0.00

* Significant at P<0.05

5. Discussion

5.1 Summary of findings

The results from this study provide insight into pediatric dentists' understanding, attitudes, beliefs, and practices towards HPV vaccination. The study reveals that most of the pediatric dentists treating adolescent patients are knowledgeable about HPV and HPV vaccines. Most of the respondents felt that HPV vaccine is safe and can prevent some or all of HPV associated cancers. The results of the hypothesis tests showed that pediatric dentists' that treat adolescent patients are not more likely to recommend the HPV vaccination. Similarly, dentists that have taken CE courses on HPV and oral cancer are not more likely to recommend the HPV vaccination. We have no data to indicate what the content of the training received was, but this findings may suggest that training alone is not sufficient to change or motivate the behavior.

The results show that pediatric dentists are not recommending the HPV vaccines by counseling their adolescent patients and parents about the HPV-associated oral cancer or HPV vaccination to prevent oral cancer. This is important because several studies have shown that a recommendation from a health care provider is an important factor in parents' acceptance of HPV vaccination.

Pediatric dentists reported being uncomfortable administering the HPV vaccines in their office even if adequately reimbursed due to lack of skills and resources. The majority of respondents plan on referring the patients to their pediatrician for HPV vaccination. It can be concluded from our study that the majority of the pediatric dentists do not identify providing HPV vaccination as part of their role and are uncomfortable discussing HPV

vaccination with their adolescent patients. The data confirm that pediatric dentists' beliefs about HPV vaccine being beneficial are significant in assessing level of involvement with HPV vaccine.

Pediatric dentists' level of involvement in promoting HPV vaccination is inadequate and can be explained by our final regression model, which identifies comfort levels, identification with the role of vaccinating, and assessment of the vaccine as being beneficial as important predictors. Knowledge of the HPV vaccine and resources to provide the HPV vaccine did not predict pediatric dentists' level of involvement in HPV vaccination. Therefore, we conclude that interventions should target pediatric dentists' to improve comfort levels, encourage identification in the role of vaccinating, and help them recognize that vaccination would enhance the health of their adolescent patients.

The most direct way to change role identification is to change the guidelines. Currently, the American Academy of Pediatric Dentistry (AAPD) does not have any guidelines, policy or recommendations on HPV vaccination. The CDC can play an important role by lobbying with organized dentistry to establish and clarify guidelines. Most pediatric dentists follow the ADA and AAPD guidelines and recommendations. Having such policies would help define the role of pediatric dentists in improving the uptake of HPV vaccination. Guidelines could enhance in role identification of pediatric dentists for providing HPV vaccination. Therefore, having a guideline on HPV infection and immunization can be beneficial in increasing the likelihood pediatric dentists in playing an active role in HPV vaccination thereby reducing the mortality rates of HPV related cancers.

Pediatric dentists are generally not comfortable discussing HPV vaccinations with adolescent patients. Pediatric dentists could improve their comfort levels by practicing these conversations with their patients. This would also help in dealing with other sensitive and negative issues, and help dentists build self-confidence. Hands on workshops on HPV vaccination, including practice giving injections, will improve the comfortability of pediatric dentists in providing HPV vaccination.

5.2 Strengths' of the study

This is the first study to explore the association of pediatric dentists with HPV vaccine. The subjects were randomly selected from American Board of Pediatric Dentistry's membership list, increasing the likelihood that this sample represents the group accurately and from all across the United States. The study was anonymous thereby encouraging honest responses by the respondents.

5.3 Limitations of the study

The biggest limitation of this was study was the small number of respondents (N=126) with a 25% response rate. The results from this study may not be generalizable to all pediatric dentists. It is unclear whether respondents and non-respondents have similar attitudes and beliefs about HPV vaccination. Finally respondents answer to the survey may be subject to recall bias.

5.4 Significance of the study

The overall results indicate that pediatric dentists are not playing a sufficient role as oral health care providers in recommending HPV vaccination for their adolescent patients.

Their current level of involvement isn't adequate to increase HPV vaccination uptake. However, improving pediatric dentists' comfort level in assessing, recommending and administering HPV vaccination is critical to overcome barriers to HPV uptake amongst adolescent patients. It is essential to change the behavioral intentions of pediatric dentists. Strategies might include increasing provider motivation through education, hands-on, skills- building workshops to ensure well trained, confident and skilled health care providers. The AAPD should form guidelines and recommendations for HPV vaccination for pediatric dentists in order to increase their role identification with the vaccine.

5.5 Implications for future research

The results from this study can be used to understand the behavior of pediatric dentists towards HPV vaccination and interventions to improve the attitudes or change behavior of of pediatric dentists towards HPV vaccination. In addition, further studies are needed to identify facilitators and barriers to recommending HPV vaccination amongst pediatric dentists. Future studies should evaluate pediatric dentists' willingness to deliver and administer the HPV vaccine if they were provided with adequate training.

6. CONCLUSIONS

- 1) Pediatric dentists who treat adolescent patients are not more likely to recommend HPV vaccination than pediatric dentists who do not treat adolescent patients.
- 2) Pediatric dentists who had training in oral cancer and HPV are not more likely to recommend the HPV vaccination than pediatric dentists who did not receive training in oral cancer and HPV.
- 3) Pediatric dentists' level of involvement in providing HPV vaccine was a function of their self-evaluation of comfort and skill level regarding HPV vaccine, identification with the role of vaccinating, and assessment of the vaccine as being beneficial. Resources and knowledge did not influence level of involvement.

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APPENDICES

APPENDIX A

Dear Doctors,

My name is Zameer Ali Khan and I am a second year pediatric dental resident at the University of Illinois at Chicago. I am conducting research to investigate the understanding and attitudes of pediatric dentists towards HPV vaccines. I would like to invite you to participate in this research project by answering the attached survey.

There are no known risks for your participation. The survey will take a few minutes to complete and we will ask for no identifiers. While there is a number on your return envelope, we will use this number only to determine whether we should include you in the second mailing. The information collected will provide us with beneficial information on knowledge, attitude and intentions regarding Human Papilloma Virus and HPV vaccinations among pediatric dentist in the United States.

If you agree to participate in this study, please complete the attached questionnaire. Taking part in this study is voluntary. You do not have to answer any questions that make you uncomfortable. If you have any questions, concerns or complaints about the research study, please contact me at 281-781-6694 or at zkhan28@uic.edu. You may also contact my research advisor, Sahar Alrayyes at salray1@uic.edu

If you have any questions about your rights as a research subject, please contact the Office for the Protection of Research Subjects of University of Illinois at Chicago at 312-996-1711 or 1-866-789-6215 (toll-free) or e-mail OPRS at uicirb@uic.edu.

APPENDIX A (continued)

Sincerely,

Zameer Ali Khan, DDS

Pediatric Dentistry Resident

Sahar Alrayyes, DDS, MS

Faculty, UIC College of Dentistry

APPENDIX B

A) Demographics

- 1) I am _____ Male _____ Female
- 2) Which of the following best describes you? (Please check all that apply.)
 - a) Asian _____ b) Caucasian/White _____ c) Black/African/Africa American _____
 - d) Hispanic _____ e) Middle Eastern _____ f) Other (Please specify.) _____

B) Clinical Practice

- 1) What year did you graduate from pediatric residency? _____
- 2) Which one of the following best describes your current employment status? (Please check the best option.)

_____ Solo Practitioner	_____ Partner in group practice
_____ Employee in group practice	_____ Associate
_____ Academics	_____ Other (Please specify.) _____
- 3) How many adolescent patients do you see in a regular week, including initial examinations, periodic oral examinations, and operative appointments?
 (Please give us your best estimate.) _____ Patients
- 4) What percentages of your patients are adolescent in a regular week?
 (Please give us your best estimate.): _____ % of patients
- 5) Have you ever attended a continuing education (CE) course on Oral Cancer? ____ Yes
 ____ No
 If Yes, in what year did you have your most recent CE on this topic? _____
- 6) Have you ever attended a continuing education (CE) course on for Human papilloma virus (HPV)? ____ Yes ____ No
 If Yes, in what year did you have your most recent CE on this topic? _____
- 7) With what percentage of your adolescent patients do you discuss oral cancer and its risk factors?
 (Please give us your best estimate.) _____ % of patients

APPENDIX B (continued)

8) With what percentage of your adolescent patients do you allow parents to accompany their children for patient education?

(Please give us your best estimate.) _____ % of patients

9) With what percentage of your adolescent patients do you ask parents about the immunization status of their adolescent children?

(Please give us your best estimate.) _____ % of patients

10) Do you provide health related educational brochures in your waiting area/on your website, or give educational brochures to adolescent patients on any of the following subjects?

HPV associated oral cancer _____ Yes _____ No

Vaccinations to prevent oral cancer and cervical cancer caused by HPV _____ Yes _____ No

11) With what percentage of your adolescent patients do you provide verbal counseling on HPV vaccinations to prevent oral cancer?

(Please give us your best estimate.) _____ % of patients

We would like to know your opinion about each of these statements, please circle the answer that best fits your opinion.

12. Do you think HPV causes cervical cancer?

1 = Yes

2 = No

3 = I don't know

13. Do you think HPV causes genital warts?

1 = Yes

2 = No

3 = I don't know

14. Do you think HPV causes anal cancer?

1 = Yes

2 = No

3 = I don't know

15. Do you think HPV causes oral cancer?

1 = Yes

2 = No

3 = I don't know

APPENDIX B (continued)

For each of the following statements, please indicate whether you think it is true or not true.

16. According to Advisory Committee on Immunization Practices (ACIP) the recommended age group for HPV vaccinations is 9-11years.

- 1 = True
- 2 = Not true
- 3 = I don't know

17. Most states require girls entering sixth grade (age 11years) to get HPV vaccinations unless their parents choose to exempt.

- 1 = True
- 2 = Not true
- 3 = I don't know

18. Insurance companies usually provide coverage for HPV vaccinations.

- 1 = True
- 2 = Not true
- 3 = I don't know

For each of the following questions, please indicate the extent to which you agree or disagree.

19. I believe HPV vaccination could prevent some or all of these diseases.

- 1 = Strongly disagree
- 2 = Disagree
- 3 = Neither agree nor disagree
- 4 = Agree
- 5 = Strongly agree

20. I believe HPV vaccinations are safe in adolescent patients.

- 1 = Strongly disagree
- 2 = Disagree
- 3 = Neither agree nor disagree
- 4 = Agree
- 5 = Strongly agree

APPENDIX B (continued)

21. I think it fits in the role of pediatric dentist to provide HPV vaccination counseling to adolescent patients.

- 1 = Strongly disagree
- 2 = Disagree
- 3 = Neither agree nor disagree
- 4 = Agree
- 5 = Strongly agree

22. I have the resources I need to provide HPV vaccinations to adolescent patients.

- 1 = Strongly disagree
- 2 = Disagree
- 3 = Neither agree nor disagree
- 4 = Agree
- 5 = Strongly agree

23. I have the skills needed to provide HPV vaccinations to adolescent patients.

- 1 = Strongly disagree
- 2 = Disagree
- 3 = Neither agree nor disagree
- 4 = Agree
- 5 = Strongly agree

24. I think recommending HPV vaccinations would enhance the health of my adolescent patients.

- 1 = Strongly disagree
- 2 = Disagree
- 3 = Neither agree nor disagree
- 4 = Agree
- 5 = Strongly agree

25. I am religiously opposed to counseling for HPV vaccinations with my patients.

- 1 = Strongly disagree
- 2 = Disagree
- 3 = Neither agree nor disagree
- 4 = Agree
- 5 = Strongly agree

APPENDIX B (continued)

26. I have adequate counseling skills to discuss HPV vaccinations with adolescent patients and parents.

- 1 = Strongly disagree
- 2 = Disagree
- 3 = Neither agree nor disagree
- 4 = Agree
- 5 = Strongly agree

27. I am comfortable discussing HPV vaccinations with adolescent patients and parents.

- 1 = Strongly disagree
- 2 = Disagree
- 3 = Neither agree nor disagree
- 4 = Agree
- 5 = Strongly agree

Many states allow dentists to administer vaccinations as part of their services to the public. How do you perceive your level of involvement if your state allows administering vaccinations?

28. I would deliver HPV vaccination to patients if I am adequately reimbursed.

- 1 = Strongly disagree
- 2 = Disagree
- 3 = Neither agree nor disagree
- 4 = Agree
- 5 = Strongly agree

29. I plan on administering the vaccination in my office.

- 1 = Strongly disagree
- 2 = Disagree
- 3 = Neither agree nor disagree
- 4 = Agree
- 5 = Strongly agree

APPENDIX B (continued)

30. I plan on referring my patients to their pediatricians regarding HPV vaccinations.

- 1 = Strongly disagree
- 2 = Disagree
- 3 = Neither agree nor disagree
- 4 = Agree
- 5 = Strongly agree

31. I do not plan on recommending the HPV vaccination or referring my patients to their pediatricians for HPV vaccinations.

- 1 = Strongly agree
- 2 = Disagree
- 3 = Neither agree nor disagree
- 4 = Agree
- 5 = Strongly disagree

Thank you for participating in the survey!

APPENDIX C**UNIVERSITY OF ILLINOIS
AT CHICAGO**

Office for the Protection of Research Subjects (OPRS)
Office of the Vice Chancellor for Research (MC 672)
203 Administrative Office Building
1737 West Polk Street
Chicago, Illinois 60612-7227

Exemption Granted

October 16, 2013

Zameer Khan, DDS

Pediatric Dentistry

Exemption Granted

October 16, 2013

Zameer Khan, DDS

Pediatric Dentistry

801 S. Paulina St

M/C 850

Chicago, IL 60612

Phone: (312) 996-7530 / Fax: (312) 412-8006

RE: Research Protocol # 2013-0987

“The Understanding and Attitudes of Pediatric Dentists Towards HPV Vaccines”

Sponsors: None

APPENDIX C (continued)

Dear Dr. Khan:

Your Claim of Exemption was reviewed on October 16, 2013 and it was determined that your research protocol meets the criteria for exemption as defined in the U. S. Department of Health and Human Services Regulations for the Protection of Human Subjects [(45 CFR 46.101(b))]. You may now begin your research.

Exemption Period:	October 16, 2013 – October 16, 2016
Performance Site:	UIC
Subject Population:	Adult (18+ years) subjects only
Number of Subjects:	500

The specific exemption category under 45 CFR 46.101(b) is:

(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

You are reminded that investigators whose research involving human subjects is determined to be exempt from the federal regulations for the protection of human subjects still have responsibilities for the ethical conduct of the research under state law and UIC policy. Please be aware of the following UIC policies and responsibilities for investigators:

1. **Amendments** You are responsible for reporting any amendments to your research protocol that may affect the determination of the exemption and may result in your research no longer being eligible for the exemption that has been granted.
2. **Record Keeping** You are responsible for maintaining a copy all research related records in a secure location in the event future verification is necessary, at a minimum these documents include: the research protocol, the claim of exemption application, all questionnaires, survey instruments, interview questions and/or data collection instruments associated with this research protocol, recruiting or advertising materials, any consent forms or information sheets given to subjects, or any other pertinent documents.
3. **Final Report** When you have completed work on your research protocol, you should submit a final report to the Office for Protection of Research Subjects (OPRS).

APPENDIX C (continued)

4. Information for Human Subjects UIC Policy requires investigators to provide information about the research protocol to subjects and to obtain their permission prior to their participating in the research. The information about the research protocol should be presented to subjects in writing or orally from a written script. When appropriate, the following information must be provided to all research subjects participating in exempt studies:

- a. The researchers affiliation; UIC, JBVMAC or other institutions,
- b. The purpose of the research,
- c. The extent of the subject's involvement and an explanation of the procedures to be followed,
- d. Whether the information being collected will be used for any purposes other than the proposed research,
- e. A description of the procedures to protect the privacy of subjects and the confidentiality of the research information and data,
- f. Description of any reasonable foreseeable risks,
- g. Description of anticipated benefit,
- h. A statement that participation is voluntary and subjects can refuse to participate or can stop at any time,
- i. A statement that the researcher is available to answer any questions that the subject may have and which includes the name and phone number of the investigator(s).
- j. A statement that the UIC IRB/OPRS or JBVMAC Patient Advocate Office is available if there are questions about subject's rights, which includes the appropriate phone numbers.

Please be sure to:

àUse your research protocol number (listed above) on any documents or correspondence with the IRB concerning your research protocol.

We wish you the best as you conduct your research. If you have any questions or need further help, please contact me at (312) 355-2908 or the OPRS office at (312) 996-1711. Please send any correspondence about this protocol to OPRS at 203 AOB, M/C 672.

Sincerely,

Charles W. Hoehne

Assistant Director

Office for the Protection of Research Subjects

cc: David Crowe, Pediatric Dentistry, M/C 850

Marcio Da. Fonseca, Pediatric Dentistry, M/C 850

Sahar Alrayyes, Pediatric Dentistry, M/C 850

801 S. Paulina St

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Chicago, IL 60612

Phone: (312) 996-7530 / Fax: (312) 412-8006

APPENDIX D**UNIVERSITY OF ILLINOIS
AT CHICAGO**

Office for the Protection of Research Subjects (OPRS)
Office of the Vice Chancellor for Research (MC 672)
203 Administrative Office Building
1737 West Polk Street
Chicago, Illinois 60612-7227

Exemption Determination**Amendment to Research Protocol – Exempt Review****UIC Amendment # 1**

January 17, 2014

Zameer Khan, DDS

Pediatric Dentistry

Exemption Determination

Amendment to Research Protocol – Exempt Review

UIC Amendment # 1

January 17, 2014

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APPENDIX D (continued)

RE: Protocol # 2013-0987

“The Understanding and Attitudes of Pediatric Dentists Towards HPV Vaccines”

Dear Dr. Khan:

The OPRS staff/members of Institutional Review Board (IRB) #2 have reviewed this amendment to your research, and have determined that your research protocol continues to meet the criteria for exemption as defined in the U. S. Department of Health and Human Services Regulations for the Protection of Human Subjects [(45 CFR 46.101(b))].

The specific exemption category under 45 CFR 46.101(b) is:

(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

You may now implement the amendment in your research.

Please note the following information about your approved amendment:

Exemption Period: January 17, 2014 – January 17, 2017

Amendment Approval Date: January 17, 2014

Amendment:

Summary: UIC Amendment #1 of January 8, 2014 is an investigator-initiated amendment revising the Methods section for Research design and Eligibility criteria: The subjects included in the revised study will be Members of the College of Diplomates of the American Board of Pediatric Dentistry.

You are reminded that investigators whose research involving human subjects is determined to be exempt from the federal regulations for the protection of human subjects still have responsibilities for the ethical conduct of the research under state law and UIC policy. Please be aware of the following UIC policies and responsibilities for investigators:

APPENDIX D (continued)

1. Amendments You are responsible for reporting any amendments to your research protocol that may affect the determination of the exemption and may result in your research no longer being eligible for the exemption that has been granted.

2. Record Keeping You are responsible for maintaining a copy all research related records in a secure location in the event future verification is necessary, at a minimum these documents include: the research protocol, the claim of exemption application, all questionnaires, survey instruments, interview questions and/or data collection instruments associated with this research protocol, recruiting or advertising materials, any consent forms or information sheets given to subjects, or any other pertinent documents.

3. Final Report When you have completed work on your research protocol, you should submit a final report to the Office for Protection of Research Subjects (OPRS).

Please be sure to:

àUse your research protocol number (2013-0987) on any documents or correspondence with the IRB concerning your research protocol.

We wish you the best as you conduct your research. If you have any questions or need further help, please contact me at (312) 355-2908 or the OPRS office at (312) 996-1711. Please send any correspondence about this protocol to OPRS at 203 AOB, M/C 672.

Sincerely,

Charles W. Hoehne, B.S., C.I.P.

Assistant Director

Office for the Protection of Research Subjects

cc: Marcio Da. Fonseca, Pediatric Dentistry, M/C 850

 Sahar Alrayyes, Pediatric Dentistry, M/C 850

 801 S. Paulina St

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VITA

Zameer Ali Khan, D.D.S

FORMAL EDUCATION

Bachelor of Dental Surgery (BDS) <i>Bapuji Dental College & Hospital, Davangere, India</i>	May 2002
Doctor of Dental Surgery (DDS) <i>University of Illinois at Chicago, Chicago, IL</i>	May 2012
Certificate in Pediatric Dentistry <i>University of Illinois at Chicago, Chicago, IL</i>	June 2014
Master of Science in Oral Sciences (MS) <i>University of Illinois at Chicago, Chicago, IL</i>	June 2014

PROFFESIONAL EXPERIENCES

Pediatric Dental Health Associate, Brite Dental Chicago

Pediatric Dental Health Associate, Access Dental Centre, IL

Dental Assistant, Bella Dental, Katy, Texas

General Dentist Associate, Amal Medical Care Clinic & Diagnostic Center, Saudi Arabia

Product Specialist, Almarfa Medical, Riyadh, Saudi Arabia

General Dentist Associate, Dr. Pooya's Health Care Centre, Bangalore, India

LICENSURE & CERTIFICATIONS

Pediatric Advanced Life Support (PALS), University of Illinois at Chicago

Advanced Cardiac Life Support (ACLS), University of Illinois at Chicago

PROFESSIONAL AFFILIATIONS

American Academy of Pediatric Dentistry (AAPD)

Illinois Society of Pediatric Dentistry (ISPD)

American Dental Association (ADA)