J Immigrant Minority Health (2018) 20:1236–1242
DOI 10.1007/s10903-017-0646-9

ORIGINAL PAPER

Primary Care Physicians' Role in Parental Decision to Vaccinate with HPV Vaccine: Learnings from a South Texas Hispanic Patient Population

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Published online: 19 August 2017

Abstract Hispanic populations have low HPV vaccination rates, although the vaccine is safe and efficacious. We surveyed a low-income Hispanic population to characterize knowledge gaps about the HPV vaccine and understand factors associated with the decision to vaccinate a child to determine how physicians can enhance vaccination rates. Surveys in English and Spanish were distributed to parents of children under age 18. Statistical analysis included logistic regression. Knowledge that the vaccine can prevent invasive cervical cancer most impacted intent to vaccinate. Physician recommendation to vaccinate was far more influential in a parent's decision compared to TV and other sources. Girls are more likely to receive the HPV vaccine over boys. While physician recommendation is critical, they have minimal time for education. Our results suggest that physicians should focus on the vaccine's link to cancer prevention, leaving other knowledge areas for the interdisciplinary care team.

Keywords HPV vaccine · Primary care · Physician-patient communication · Hispanic

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Introduction

Cervical cancer is the leading cause of cancer-related deaths among women in developing countries and is the second most common cancer among women worldwide [1]. According to the NIH's National Cancer Institute Surveillance, Epidemiology and End Results Program (SEER), 2017 estimates anticipate 12,820 new cases of cervical cancer this year and 4210 individuals anticipated to die in this same timeframe [2]. Among newly diagnosed cases, Hispanic populations are most at-risk; Hispanic women have the highest incidence of invasive cervical cancer and the second highest mortality rates in the US compared to other racial/ethnic groups [2].

Of the 20 million new sexually transmitted infections each year, 49% of them, or 14.1 million are due to the human papillomavirus (HPV) [3]. Persistent infection with the human papillomavirus (HPV) is the main culprit of cervical cancer cases [4]. Epidemiological studies estimate that approximately 50–70% of sexually active women are infected with HPV at some point in their lifetimes [1]. Fortunately, cervical cancer is highly preventable through screening conducted via a Papanicolaou test and through the advent of the HPV vaccine, a remarkable public health achievement [5].

In 2011, the Advisory Committee on Immunization Practices (ACIP) recommended that HPV vaccination should be initiated at age 11 or 12; however initial doses can be started as early as age 9 [6]. ACIP subsequently extended their guidelines to males up to the age of 21 and females up to the age of 26 [7]. National estimates for the initiation of the HPV vaccine among females remains low with estimates ranging from 5 to 26% [4]. The quadrivalent HPV vaccine which protects against types 6, 11, 16 and 18 has been demonstrated to be safe and has exceptional efficacy

rates of 98.2% or higher in protecting females from the four high risk subtypes [1, 8].

Previous studies report multiple barriers to HPV vaccination including: low levels of knowledge among minority populations; language barriers; rural location; cost; and lack of provider recommendation. Cervical cancer is becoming known as a disease of the poor and increasingly more prevalent among underprivileged women [9, 10]. Although research indicates that Hispanic females are at an increased risk of being diagnosed with cervical cancer, research on specific Hispanic populations yield different findings underscoring the fact that Hispanic populations in the US are not homogenous and are influenced differently by diverse factors [7].

We sought to evaluate the knowledge of HPV and factors that influence intent to vaccinate in a predominantly low-income urban and suburban Hispanic patient population; we specifically wanted to understand how family medicine physicians can influence HPV vaccination rates. While provider recommendation plays an important role, we sought to understand which knowledge areas are more influential in parental decision making in order to make better use of physician time.

Methods

A survey was developed to inquire about respondents' knowledge of HPV and its connection to cervical cancer, the benefits and risks of the HPV vaccination, intended target of the vaccine as well as variables that influence intention to vaccinate. Survey participants used a 5-point likert scale to indicate their response (strongly agree to strongly disagree). The study received Institutional Review Board approval from both the University of Texas Health Science Center at San Antonio and CHRISTUS Health.

Setting

Our study is based at two family medicine clinics, one urban and one suburban, which serve a predominantly Hispanic patient population and where 41% of the family medicine physicians are of Hispanic ethnicity and 63% of physicians speak Spanish. Located in San Antonio, Texas the suburban clinic is a NCQA level 3 certified Patient-Centered Medical Home, which is the continuity clinic for Family Medicine residents and faculty.

Participants

Our patient population is primarily low-income and Hispanic ethnicity. The survey was distributed to all parents of patients aged 18 years and younger who were seen for annual well child exams across both family medicine clinics. Surveys were available in English or Spanish giving parents the option to complete the anonymous survey in either language. Surveys were distributed during the summer of 2014 by front desk personnel at check-in without clinical staff counseling. A total of 495 surveys were collected from both clinical sites, resulting in a response rate of 50 percent.

Analysis

Survey data were recorded into Excel and analyzed using STATA 13. Descriptive statistics included frequency analysis and cross tabulations, in addition to Chi square statistics as appropriate. Logistic regression analysis was conducted to understand predictors that influenced intent to vaccinate a child. Using intent to vaccinate child with HPV as the dependent variable, logistic regression was used to understand how independent variables such as race (White non-Hispanic vs. all others), child's gender (male vs. female), parental role (mother, father or legal guardian) and parental education (high school or less vs. some college or more) influenced parental decision to vaccinate. In addition, based on the hypothesis that increased knowledge is associated with increased likelihood of intention to vaccinate, we used regression analysis to explore the relationships between knowledge on specific HPV content with intention to vaccinate.

Results

Of the 495 surveys collected, 393 came from our suburban clinic and 102 were from our urban site. Data from the two sites follow similar trends and thus were analyzed together. The overwhelming majority of survey respondents were mothers (82%) with some college or more formal education (57%) covered by Medicaid (65%). In terms of racial composition, the overwhelming majority of patients were of Hispanic origin (74%), with Non-Hispanic Whites making up the largest minority (16%). The sample had a good gender balance, as fifty-one percent of the children were female. The sample included the following age groups: ages 9–12 years (47%), ages 13–15 years (31%) and ages 16–18 years (22%). See Table 1 for descriptive statistics of the sample population.

Parental knowledge and Intent to Vaccinate

Through five questions using a five point Likert scale, parents were asked about HPV's causal relationship to warts and cervical cancer as well as their understanding of the vaccine's safety and side effects. Although the majority reported awareness of the association between HPV with

Table 1 Descriptive statistics of survey respondents

	Westover Hills % (N)	Downtown % (N)	Combined % (N)
Role			
Mothers	81 (278)	86 (74)	82 (352)
Fathers	14 (47)	7 (6)	12 (53)
Legal guardian	6 (19)	7 (6)	6 (25)
Education achieved			
Some high school	12 (43)	21 (19)	14 (62)
HS diploma/ GED	29 (103)	30 (27)	29 (130)
Some college	34 (122)	34 (31)	34 (153)
Undergrad	14 (48)	9 (8)	13 (56)
Graduate	11 (38)	7 (6)	10 (44)
Gender of my child			
Male	50 (184)	40 (39)	49 (223)
Female	50 (182)	60 (53)	51 (235)
Child's race			
White, Non-Hispanic	16 (56)	16 (14)	16 (70)
Hispanic	73 (261)	79 (70)	74 (331)
African American/Black	4 (15)	4 (4)	4 (19)
Other	7 (26)	1 (1)	6 (27)
Age of my child			
9–12 yrs	48 (107)	44 (28)	47 (135)
13–15 yrs	33 (74)	27 (17)	31 (91)
16–18 yrs	19 (44)	30 (19)	22 (63)
Personal history of HPV			
Yes	8 (28)	4 (4)	7 (32)
No	92 (330)	96 (88)	93 (418)

warts and cervical cancer (56%), nearly 61% reported being unsure or disagreeing with the belief that the HPV vaccine prevents cancer. Furthermore, over half reported being unsure if the HPV vaccine is approved for both boys and girls (58%). Forty three percent of parents reported that they had already made the decision to vaccinate their child with the HPV vaccine and 13% decided against vaccination; a significant percentage, 43%, were undecided or unsure at the time of the survey. The fact that 43% had already made the decision to vaccinate their child was surprising not only because it exceeds rates published elsewhere, but also given that parents reported low levels of knowledge about the vaccine [11]. See Table 2 for results to the knowledge questions.

Increased knowledge about HPV or the vaccine is associated with increased odds of vaccination. In fact, regression analyses revealed that the most important knowledge-related predictor of intent to vaccinate was the ability of the vaccine to prevent cancer (OR 9.55, CI 4.29–21.36); knowledge that the vaccine is appropriate for boys and girls, knowledge about the fact that HPV can cause cancer, or that HPV can cause warts or knowledge of the vaccine's risk and benefits are less influential on the parent's decision to vaccinate. See Table 2 for regression results.

Where Parents Learn About HPV Vaccine is Important

The medium by which parents initially learned about the vaccine is significant for the decision to vaccinate a child with the HPV vaccine. Respondents were asked to select the main reason they chose to vaccinate their child, and the two primary reasons that emerged were physician recommendation (40%) and to protect against cancer (20%). Those who chose not to vaccinate were concerned about side effects (19%) and moral concerns (13%) or perceived that their physician did not encourage the vaccine (11%). Forty percent of respondents learned about the vaccine at their doctor's office, followed by 30% reporting the TV as their initial source with "other" a distant third option with only 13%. See Table 3 for response categories and results.

While our study also confirms that provider recommendation is important, a unique finding in our study is that where parents first learned about the HPV vaccine is also influential. By far, physician offices are the most influential

Table 2 Knowledge assessment results (combined sites)

	Strongly agree/agree (%)	Unsure/ don't know (%)	Strongly disagree/disagree (%)	Logistic regression results (intent to vaccinate as dependent variable)
I know that HPV can cause warts & cervical cancer (ref: disagree/strongly disagree)	56	39	5	2.71** (CI 1.48–4.98)
I know about the benefits and risks of the HPV vaccine (ref: disagree/strongly disagree)	49	44	7	3.88** (CI 2.07–7.28)
I believe that HPV vaccine prevents cancer (ref: disagree/ strongly disagree)	38	53	8	9.55** (CI 4.29–21.36)
HPV vaccine is approved for girls only	19.5	49.5	31	N/S 1.21 (CI 0.54–2.71)
HPV vaccine is approved for boys and girls	38	58	4	4.56** (CI 2.33–8.95)

*$p < 0.05$, **$p \leq 0.01$

Table 3 Where respondent first heard about HPV vaccine: frequency & regression results

First heard about vaccine	Westover hills site	Downtown site	Combined	Logistic regression (intent to vaccinate as dependent variable)
TV	(84) 29%	(23) 32%	(107) 30%	
TV (Ref: all other categories)				0.32* (CI 0.16–0.66)
Internet	(9) 3%	0	(9) 3%	[a]
Newspaper	(4) 1%	1 (1%)	(5) 1%	[a]
Family/friends	(32) 11%	(3) 4%	(35) 10%	[a]
Doctor's office	(121) 42%	(36) 49%	(157) 44%	
Doctor's office Ref: all others				2.07* (CI 1.00–4.30)
Ref: TV				3.31* (CI 1.47–7.46)
Other	(37) 13%	(10) 14%	(47) 13%	[a]

[a]Categories too small to run individual regression models; these were consolidated into the reference for the regression analyses

medium. Using intent to vaccinate as the dependent variable, parents who first learned about the HPV vaccine in their physician's office were two times more likely to vaccinate their children (OR 2.07, CI 1.0–4.29) than those who learned about it elsewhere. Television had a much milder influence (OR 0.32, CI 0.16–0.66). In fact, respondents were three times more likely to vaccinate their children if they learned about the vaccine in their physician's office, compared to those who learned about it on television (OR 3.31, CI 1.46–7.46). This finding contradicts other studies that indicate that Latino populations are more influenced by media sources [11].

Child and Parental Gender

Another novel finding is the association of the child's gender with the indecision to vaccinate. More parents had made the decision to vaccinate their daughters compared to their sons (52 vs. 39%). Furthermore, our results confirm a relationship between parents with a son and being more likely to be unsure whether to vaccinate their son (50%) compared to parents with a daughter (35%); this relates to the fact that the majority of parents (57%) were unsure if the HPV vaccine is approved for both genders (Table 4). Logistic regression results demonstrate that parents are more than four times likely to vaccinate their child if they know that the vaccine is approved for both genders. Perhaps ironically, parental gender/role (i.e. mother, father or legal guardian) was not significant for intent to vaccinate; mothers and fathers did not differ in their decision making. Parental education was not significant for intention to vaccinate.

Table 4 Descriptive results: decision to vaccinate child with other variables

	Decision to vaccinate			Chi square or fisher's exact p-value
Gender of child	Yes (N)	No (N)	Unsure (N)	0.02
Male	39% (71)	11% (19)	50% (90)	
Female	52% (85)	12% (20)	35% (57)	
Parental role/ gender	Yes (N)	No (N)	Unsure (N)	0.66
Father	39% (18)	17% (8)	43% (20)	
Mother	47% (143)	11% (33)	42% (127)	
Legal guardian	42% (10)	12% (3)	46% (11)	
Parental education	Yes (N)	No (N)	Unsure (N)	0.39
Some high school	35% (17)	15% (7)	50% (24)	
High school/ GED	45% (45)	13% (13)	43% (43)	
Some college	49% (62)	10% (13)	41% (52)	
Undergrad degree	39% (17)	9% (4)	52% (23)	
Graduate degree	59% (22)	14% (5)	27% (10)	

Significance level was set at $\alpha = 0.05$

Discussion

Our surveyed population demonstrates knowledge deficits with respect to the HPV vaccine's risks and benefits, its ability to prevent cervical cancer and its recommended use for both genders. In our investigation, knowledge of the human papillomavirus and the HPV vaccine was strongly associated with intent to vaccinate. Our research is significant not only because to our knowledge it represents one of the largest cross sectional studies conducted among a predominantly low-income urban and suburban Hispanic patient population, but also because of the setting of the study [5].

Our results support findings in the literature in other patient populations, but extend them to a predominantly low-income insured Hispanic population [12–18]. These

results are also significant in light of the fact that language and perceived cultural barriers are less of an issue in our medical home given the significant percentage of Spanish speaking physicians and physicians of Hispanic origin; even when physicians can speak the same language as patients and mirror their cultural heritage, significant knowledge gaps prevail.

Interestingly, parents' level of education was not associated with intent to vaccinate. Although those with some college or greater education were 1.5 times more likely to vaccinate than those with less education, the regression model did not reach statistical significance. Our study suggests that parents' specific knowledge about the HPV vaccine and its ability to prevent invasive cervical cancers is more important than parental education level in considering vaccination for their children. Our study confirms that provider recommendation is critical in intent to vaccinate as physician recommendation was associated with higher rates of vaccination intent (85 vs. 74%, $p < 0.05$) but adds that the medium for where parents first learn about the vaccination is important. Parents are two or three times more likely to vaccinate if they hear about the vaccine from the physician as part of a consult. While mothers or fathers are virtually equally likely to decide to vaccinate, there is a clear gender bias in favor of vaccinating girls, perhaps because cervical cancer is known as a women's health issue. Hispanic males are an especially vulnerable population in this context.

These results have important implications, particularly for physicians. First of all, family medicine physicians need to provide targeted, scientifically sound recommendations regarding HPV and benefits of the HPV vaccine to parents at each well child visit in the adolescent and teenage years (i.e. ages 11–18). Second, family physicians should play an active role in educating the parents of their patients, especially in the area of preventative care as it pertains to vaccination. One way of being more proactive is to distribute health related information before hand, giving parents an opportunity to read and reflect on the information before they see the physician. Primary care physicians should also ensure that education is a part of every well-visit to allow them to cover a wide array of preventative topics over a longer period of time, not condense it close to the recommended age of HPV vaccination onset. Our study highlights the powerful role family physicians have in influencing patients' decision-making. Third, family physicians need to be cognizant of the overall knowledge gap among Hispanic parents and recognize the bias against male vaccination in order to appropriately protect males and females in relationships with those males. Family medicine physicians have an increased responsibility to guide parents and help them understand that HPV vaccination is encouraged for both genders, however studies report that physicians are less likely to strongly encourage the HPV vaccine for male patients exacerbating health disparities for Hispanic males [19, 20]. These trends can be corrected through changes to medical school and residency training curricula as well as to continuing medical education in preventative care. Targeted educational forums can underscore the importance of physician recommendation and how their own biases can negatively impact vulnerable populations. Primary care providers need to be more mindful that even within insured patient populations, Hispanic females and males are potentially more at-risk. The ACIP reported that from 2006 to 2010, 38% of the 33,160 HPV-associated cancers diagnosed in the US occurred among males. Of the 9000 HPV-associated oropharyngeal cancers diagnosed during that time frame, 80% occurred in men [6].

While physicians have an important role to play, they are also faced with serious time limitations. Physicians have to address patient or family-driven questions as well as educate patients and parents about diverse topics during well visits. Through our study, we found that knowledge of the vaccine in preventing invasive cervical cancer has the greatest impact on intent to vaccinate. This is an important finding that can guide physicians on how to maximize the limited time they have; physicians can focus their efforts on explaining how the vaccine can prevent invasive cervical cancer, leaving other knowledge areas for the interdisciplinary care team.

Given that the interdisciplinary team has more time to spend with the patient (compared to a physician), they can be instrumental in providing contextual information that supports the physician recommendation and provide general information on the virus, the vaccine, and discuss concerns and specific questions. They can also play an important role in explaining how male vaccination is an important component of HPV prevention. A recommendation to our continuity clinic based on this research is that the nurse practitioner and junior residents (e.g. first year interns, second year residents), who are given more time to spend with the patient in comparison to senior residents or faculty, should spend more time introducing topics such as the HPV vaccine, cognizant of vulnerable populations that are more responsive to their recommendation. Decision support systems or prompts in the electronic medical record software will be valuable to the care team as reminders to promote the HPV vaccine among targeted audiences. Lastly, increased signage in the clinic and patient videos in waiting areas may help enhance patient awareness, prompt physicians to bring up the topic and serve as a conversation starter for the care team.

Our sample had a 43% overall intent to vaccinate rate, which is high in comparison to other studies [11]. This high vaccination rate may be due to the fact that parent respondents were insured (mostly covered by Medicaid), already at the clinic for a well-child exam and were served by a primary care team that minimized language and

cultural impediments. There is a need for more research on how to improve the health literacy of HPV in vulnerable patients that does not rely only on physicians; more effort is needed to promote the interdisciplinary care team.

Our study limitations include being unable to establish causation from the cross sectional study design, a lack of generalizability to other populations since this was a convenience sample (parents participated at their own discretion) and the fact that the survey was only distributed during the summer months. Nonetheless, our study represents one of the largest cross-sectional designs with sample that represents two patient populations across two different continuity of care clinics in the San Antonio area.

Conclusion

In conclusion, the fact that our patients continued to have knowledge gaps in spite of efforts to overcome common access and socio-cultural barriers is testament to the systems and processes and more consistent efforts that are required to overcome health disparities. Potential solutions include targeted, specific coaching to physicians while in and through continuing medical education, coaching physicians on how to maximize their time with the patient encouraging them to make recommendations relating to preventative care, formal mechanisms to promote the involvement of the interdisciplinary care team and more opportunities to engage parents and patients while they are a captive audience.

New Contribution to the Literature

Previous studies report knowledge gaps among parents and that provider recommendation is important in parental decision to vaccinate a child. Our study underscores that hearing about the vaccine by a physician, during an office visit, is significantly associated with intent to vaccinate. Our study adds to this body of literature by highlighting specific knowledge areas that are more likely to influence the decision to vaccinate. This is especially significant to physicians, who face severe time constraints, but who are influential. The study results can guide physicians to focus their time on how the vaccine plays a role in cancer prevention, utilizing the interdisciplinary care team to elaborate on other areas.

Acknowledgements The authors would like to thank the CHRISTUS Santa Rosa Family Health Center staff for their assistance in this research. The Residency Training Program received a multi-year HRSA grant for Primary Care Residency Training (D58HP20794); a small portion of that grant was used to fund this research.

Compliance with Ethical Standards

Conflict of interest All authors declare that they have no conflict of interest.

Ethical Approval The names of the organizations are removed from the blinded manuscript; the study received IRB approval from the University of Texas Health Science Center at San Antonio and at CHRISTUS Health.

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