



Adolescent health brief

Human Papillomavirus Vaccines: Factors That Affect Vaccine Knowledge and Delivery

Nneka A. Holder, M.D., M.P.H.^{a,*}, Rachel Katzenellenbogen, M.D.^b,
 and Amy B. Middleman, M.D., M.P.H., M.S.Ed.^c

^a Division of Adolescent Medicine, Akron Children's Hospital, Akron, Ohio

^b Division of Adolescent Medicine, Seattle Children's Hospital, Seattle, Washington

^c Department of Pediatrics, University of Health Sciences Center, Oklahoma City, Oklahoma

Article history: Received March 20, 2013; Accepted May 25, 2013

Keywords: Human papillomavirus vaccines; Vaccine delivery; Adolescent providers

 A B S T R A C T

Purpose: Although both vaccines are designed to prevent human papillomavirus (HPV) infection, HPV2 and HPV4 have different indications. This study sought to determine HPV and HPV vaccine knowledge among providers and examine factors affecting HPV vaccine delivery.

Methods: An e-mail survey was sent to adolescent health care providers via listserv.

Results: Provider HPV vaccine knowledge level and number of providers offering vaccine to males (84%) were high. The ability of providers to correctly distinguish between the two vaccines was associated with years in practice, proportion of female patients, provider subspecialty status, and practicing in a hospital setting.

Conclusions: This study demonstrates that adolescent medicine providers, in particular, are knowledgeable about HPV and HPV vaccines. They reported routinely offering HPV vaccine to male patients during the time before the recent change in recommendation for universal, routine HPV vaccination of males by the Advisory Committee on Immunization Practices.

© 2013 Society for Adolescent Health and Medicine. All rights reserved.

**IMPLICATIONS AND
 CONTRIBUTION**

Further research is warranted to develop effective educational strategies targeting providers less experienced with adolescent health care regarding the importance of human papillomavirus vaccination for all youth.

Human papillomavirus (HPV) is the most prevalent sexually transmitted disease [1], with genotypes divided into low or high cancer risk [2,3]. In the United States, two vaccines have been approved by the Food and Drug Administration to prevent HPV infection among adolescents and young adults. The quadrivalent vaccine (HPV4) protects against types 6 and 11 (low risk) and types 16 and 18 (high risk). The bivalent vaccine (HPV2) protects against types 16 and 18 [4]. The Centers for Disease Control and Prevention recommends HPV vaccination among those 9–26 years of age.

Factors affecting physician intention to vaccinate include HPV knowledge and attitudes toward HPV vaccination [5,6]. Likewise, several factors influence patients' decisions to receive a vaccine. However, patients are more likely to agree to HPV vaccination when recommended by their physician [7].

Although both HPV vaccines are indicated for the prevention of cervical precancerous and cancerous lesions caused by HPV, only HPV4 has additional indications for the prevention of genital warts and anal, vulvar, and vaginal cancers. No other category of vaccine includes products with such divergent indications. At the time of this study, the Advisory Committee on Immunization Practices recommended routine immunization for females (aged 9–26 years of age) with either HPV2 or HPV4. Immunization of males with HPV4, although permitted, was not routinely recommended [4]. This study sought to determine HPV and HPV2/HPV4 knowledge among providers and examine factors that affect providers' HPV vaccine knowledge and delivery.

Methods

A survey was sent electronically to members of the Society of Adolescent Health and Medicine (SAHM) and the Section of Adolescent Health of the American Academy of Pediatrics via

* Address correspondence to: Nneka A. Holder, M.D., M.P.H., Division of Adolescent Medicine, Akron Children's Hospital, One Perkins Square, Akron, OH 44308.

E-mail address: teendoc03@gmail.com (N.A. Holder).

Table 1
Participants' professional and practice characteristics

Variable	% (n)
Degree	
Medical	91 (232)
Doctor of Osteopathic Medicine	2 (5)
Registered Nurse	2 (4)
Certified Nurse Practitioner	5 (12)
Female gender	67
Years of experience in practice	
0–10	15 (39)
>10	85 (215)
Proportion of adolescent female patients	
≤50%	33 (76)
>50%	67 (155)
Proportion of patients eligible for Vaccine For Children Program	
≤50%	52 (121)
>50%	48 (110)
Specialty practiced	
Family practice	4 (11)
General pediatrics	90 (229)
Internal medicine	4 (9)
Obstetrics/gynecology	2 (5)
Subspecialty boarded	63 (161)
Adolescent medicine	99 (160)
Practice setting	
Hospital	48 (111)
Private practice	28 (65)
Other	24 (55)
Region	
Northeast	39 (89)
Midwest	20 (45)
Southeast	14 (33)
West	20 (47)
Southwest	7 (16)
HPV knowledge score: number correct of four key questions ^b	
1	<1 (1)
2	2 (4)
3	9 (22)
4	89 (241)
Offer HPV vaccine	98 (227/231 responding)
HPV4	100 (223/223; 4 indicated "not applicable")
HPV2 ^a	6 (14/223)
To males	84 (188/223)

HPV = human papillomavirus.

^a All participants offering HPV2 also offer HPV4.

^b Knowledge items included true/false items pertaining to HPV types that cause cancer, types that cause genital warts, whether approximately 50% of adults are infected with HPV, and whether genital warts can recur after treatment.

organizational listservs, from October to November 2010. Participation was voluntary and anonymous. The Institutional Review Board of Akron Children's Hospital approved the research.

The survey included four sections. The first gathered demographic and professional information. The next included knowledge questions related to HPV. The third collected information about the participants' practice, patient demographics, and whether providers offer HPV4 to males. The final section asked providers whether statements regarding disease protection, side effects, immunity duration, cross-protection, efficacy, and safety pertain to HPV2, HPV4, neither, or both.

Analysis

A total HPV knowledge score was computed by determining the total number of correct responses to four key questions.

Table 2

Associations of provider and practice characteristics to understanding and use of vaccines

Independent variable	Dependent variable(s) (%)	<i>p</i>
In practice, years ^a	Knows which vaccine(s) address warts	
0–10	72	.05
>10	85	
	Knows which vaccine(s) address cervical cancer	
0–10	80	.04
>10	91	
Adolescent females in practice	Knows which vaccine(s) address warts	
≤50%	75	.04
>50%	86	
	Knows which vaccine(s) address cross-protection	
≤50%	31	.04
>50%	46	
Gender of provider	Knows that both vaccines exhibit cross-protection	.01
Female	36	
Male	54	
Provider has subspecialty board	Knows which vaccine(s) address warts	.02
Yes	87	
No	75	
	Knows that neither vaccine has known longer immunity	
Yes	93	<.01
No	76	
Office setting	Knows which vaccine addresses warts	.04
Hospital	88	
Private practice	73	
Other	83	
Region	Offers HPV vaccine to males	.01
Northeast	76	
Midwest	93	
Southeast	94	
West	80	
Southwest	100	

^a Logistic regression analysis including the independent variables of years in practice, percent adolescent females in the practice, provider sub-board status, and office setting indicates that only years in practice remain in the model as a significant predictor for knowing which vaccine addresses genital warts.

Associations between independent variables (HPV knowledge and provider and practice demographics) and dependent variables (specific knowledge regarding statements about HPV vaccines and whether providers offer males HPV4) were analyzed using chi-square tests and logistic regression. All analyses were conducted using SPSS, version 18.0 (SPSS, Inc, Chicago, IL).

Results

At the time of this study, 1,170 members of SAHM subscribed to its listserv, and 507 to the Section of Adolescent Health. A total of 254 providers completed this survey, for a response rate of 14.6% to 21.7% (assuming no vs. complete overlap of members, respectively). Most respondents were Doctors of Medicine, pediatricians, adolescent medicine sub-boarded, and female; had over 10 years of experience; and worked in a hospital-based practice (Table 1). Most respondents offered HPV4 to both sexes.

Table 2 shows associations between provider demographics and HPV vaccine use and understanding. Practitioners located in the Southwest were most likely to offer HPV vaccine to males. Providers who had more experience, were sub-specialists, practiced in a hospital setting, and had mostly female patients were more likely to know the differences in protection between the two vaccines. Logistic regression modeling including these independent variables and the dependent variable of knowing HPV4 protects against genital warts revealed that only years in practice remained a significant independent predictor of knowledge regarding vaccine indications.

In addition, male providers and providers with mostly female patients were more likely to know that both vaccines offer limited cross-protection against non-vaccine HPV types [8], and sub-specialists were more likely to know that the duration of protection had not been determined for either vaccine.

Discussion

This study reveals that practitioners focusing on the care of adolescents are knowledgeable regarding HPV and HPV vaccines and strongly recommend the use of HPV vaccines. The ability of providers to correctly distinguish between the two HPV vaccines was associated with greater years in practice, larger proportion of female patients, adolescent medicine subspecialty training, and a hospital-based practice. These characteristics may enhance specific knowledge of HPV owing to the clinical relevance of HPV and HPV vaccines to these providers' practice scope, given their exposure to adolescent female patients. This theory is further supported by logistic regression showing that years in practice is the independent variable most significantly associated with HPV vaccine knowledge.

In this study, most providers surveyed (84%) offered HPV4 to males; in contrast, a separate 2010 survey of primary care providers found that 37% of general pediatricians and 23% of family practitioners offered males HPV vaccination [9]. Interestingly, that survey was conducted in the Southwest, the region we found to have the greatest proportion of sub-specialists offering males HPV vaccination, which emphasizes the difference in generalists' and adolescent medicine sub-specialists' approaches to male vaccination. Differences in health care access (including insurance coverage) may account for the significant regional differences in offering HPV4 to males.

Limitations of this study include a low response rate; however, this is typical of online surveys of professionals [10].

This survey did not capture other providers treating adolescents, including general pediatricians and family practitioners, so a direct comparison of attitudes and delivery behaviors is not possible. All practice data were self-reported. Finally, the issue of cross-protection is complex; however, knowledge of cross-protection did not affect providers' vaccine delivery behaviors.

Despite these limitations, these data demonstrate that adolescent health care providers have excellent knowledge of HPV and HPV vaccines. A total of 84% of respondents offered HPV4 to males, which indicates a desire to protect males despite the lack of a routine recommendation from the CDC for male vaccination at the time this research was conducted.

Acknowledgments

This research was developed through collaboration with members of the Vaccination Committee of SAHM. The authors thank Loretta Collins for administrative support.

References

- [1] Weinstock H, Berman S, Cates Jr W. Sexually transmitted diseases among American youth: Incidence and prevalence estimates, 2000. *Perspect Sex Reprod Health* 2004;36:6–10.
- [2] Boeutner KR, Reitano MV, Richwald GA, Wiley DJ. External genital warts: Report of the American Medical Association Consensus Conference. *AMA Expert Panel on External Genital Warts. Clin Infect Dis* 1998;27:796–806.
- [3] Bosch FX, Lorincz A, Munoz N, et al. The causal relation between human papillomavirus and cervical cancer. *J Clin Pathol* 2002;55:244–65.
- [4] Centers for Disease Control and Prevention. Human papillomavirus (HPV2 and HPV4) vaccine. *MMWR Morb Mortal Wkly Rep* 2010;59:626–32.
- [5] Kahn JA, Zimet GD, Bernstein DI, et al. Pediatricians' intention to administer human papillomavirus vaccine: The role of practice characteristics, knowledge and attitudes. *J Adolesc Health* 2005;37:502–10.
- [6] Riedesel MS, Rosenthal SL, Zimet GD, et al. Attitudes about human papillomavirus vaccine among family physicians. *J Pediatr Adolesc Gynecol* 2005;18:391–8.
- [7] Rosenthal SL, Weis TW, Zimet GD, et al. Predictors of HPV vaccine uptake among women aged 19–26: Importance of a physician's recommendation. *Vaccine* 2011;29:890–5.
- [8] Lu B, Kumar A, Castellsague X, Giuliano AR. Efficacy and safety of prophylactic vaccines against cervical HPV infection and diseases among women: A systematic review and meta-analysis. *BMC Infect Dis* 2011;11:13.
- [9] Allison M, Kempe A. HPV vaccine for males: Physicians' knowledge, attitudes and practices. www.cdc.gov/vaccines/recs/acip/downloads/mtg-slides-oct10/08-5-hpv-MaleAttitudes.pdf [accessed 23.06.11].
- [10] Nicholis K, Chapman K, Shaw T, et al. Enhancing response rates in physician surveys: The limited utility of electronic options. *Health Serv Res* 2011;46:1675–82.