

Human Papillomavirus Vaccine Acceptability Among Young Adult Men

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Background: For human papillomavirus (HPV) vaccination to have maximum benefit to public health, both men and women should be vaccinated. Although efficacy trials in men are still ongoing, the HPV vaccine will likely be licensed for men in the near future. Little is known about men's interest in HPV vaccination. This study assessed whether informing men about the benefits of male HPV vaccination for their female sexual partner(s) boosted interest in the HPV vaccine beyond informing them about the benefits to men alone. Predictors of HPV vaccine acceptability were also identified.

Methods: Heterosexual male college students (n = 356) were randomly assigned to receive a self-protection versus a self-protection and partner protection message about HPV and the quadrivalent HPV vaccine. Participants provided demographic and sexual history information, HPV-related awareness and knowledge, health beliefs, and HPV vaccination intentions.

Results: Men reported moderate interest in the HPV vaccine; vaccine acceptability did not differ by experimental condition. A multivariate regression model identified several independent predictors of HPV vaccine acceptability including sexual activity, perceived susceptibility to HPV, perceived benefits of the vaccine, perceived hassle and cost of vaccination, self-efficacy for vaccination, and perceived norms for vaccination.

Conclusion: Informing men about the benefits of male HPV vaccination for reducing cervical cancer risk in women did not increase men's interest in the vaccine. Correlates of vaccine acceptability among men were generally consistent with those identified for women. Findings have important implications for future HPV vaccination campaigns targeting young adult men.

HUMAN PAPILLOMAVIRUS (HPV) IS the most common sexually transmitted infection (STI) in the United States, with the highest rates of infection observed among individuals aged 15 to 24 years.¹ Oncogenic HPV types (e.g., 16 and 18) can cause cervical, penile, and anal cancers, whereas nononcogenic HPV types (e.g., 6 and 11) can cause genital warts.^{2,3} HPV infection is common among men and women.⁴ One recent epidemiologic study reported a 65% prevalence of anogenital HPV infection in sexually active men aged 18 to 40 years.⁵ Risk factors for HPV infection in men include having multiple sexual partners, smoking, and using condoms infrequently.^{5,6}

In 2006, the US Food and Drug Administration (FDA) approved a prophylactic quadrivalent HPV vaccine for women aged 9 to 26 years (Gardasil, Merck and Co., Inc., Whitehouse Station, NJ).⁷ The vaccine protects against infection by HPVs 6, 11, 16, and 18—types responsible for over 90% of all genital warts and 70%

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of all cervical cancers.^{8,9} The HPV vaccine has been shown to be effective, safe, and well-tolerated among adolescent and young adult women.^{10,11} Comparable immunogenic responses to the quadrivalent vaccine have been observed in girls and boys aged 10 to 15 and women aged 16 to 23.¹²

The HPV vaccine is not currently approved for use in men in the United States. However, existing data suggest that HPV vaccination may provide substantial health benefits to men.^{13–15} Furthermore, as male HPV infection contributes to HPV-associated disease in women,^{16,17} vaccinating men against HPV should also be effective in reducing female disease. Indeed, some models suggest that vaccinating men and women may be the most cost-effective strategy for reducing the burden of HPV-associated disease.¹⁸ Although efficacy trials in males are still ongoing, it is reasonable to expect that the HPV vaccine will be available for adolescent and young adult men within the next few years.^{13,14}

Excluding studies of parents and physicians, most investigations of HPV vaccine acceptability have been conducted in women.^{19–22} Relatively few studies have included male participants,^{23–27} and none have focused directly on men's interest in HPV vaccination since licensure of the quadrivalent HPV vaccine. To help identify potential correlates of HPV vaccine acceptability among men, we looked to the literature in women. The primary correlates of HPV vaccine acceptability in women are health beliefs, HPV awareness and knowledge, and behavioral risk factors.^{28,29} Health beliefs associated with HPV vaccine acceptability include perceived likelihood of HPV infection, perceived effectiveness and safety of the HPV vaccine, and perceived barriers to HPV vaccination (e.g., cost).²⁸ Norms have also been shown to be important predictors of HPV vaccine acceptability.^{21,23} Perceived severity of HPV infection or cervical cancer has not emerged as a correlate of vaccine acceptability in women.^{21,23} Mixed findings have been observed for behavioral correlates of HPV vaccine acceptability (sexual activity, history of STIs, infrequent condom use, smoking). Individuals with multiple lifetime sexual partners generally report strong interest in receiving the HPV vaccine.^{21,23,30}

The goals of the current study were 2-fold. The first goal was to compare 2 different approaches to educating young adult men about HPV vaccination. Recent data suggest that highlighting the seriousness of HPV infection for women might serve to increase HPV prevention behaviors among men.³¹ Thus, we tested whether informing men about the benefits of male HPV vaccination for

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their female sexual partners (prevention of cervical cancer) would boost their interest in the vaccine over and above informing them about the benefits for men alone (protection against genital warts and anogenital cancers). We hypothesized that men, particularly those men who were in a committed romantic relationship with a female partner, would display greater vaccine acceptability when exposed to the partner protection benefits of HPV vaccination. The second goal was to identify predictors of HPV vaccine acceptability among young adult men. We drew on theory (e.g., Health Belief Model³²) and previous research^{28,29} in selecting potential predictor variables. Predictors of HPV vaccine acceptability among men were expected to be similar to those previously observed for women.

Materials and Methods

Participants

Male college students ($n = 369$) recruited from Florida State University participated for course credit. Men who were gay or bisexual ($n = 11$), men who reported an HPV or genital warts diagnosis ($n = 1$), and men who had already received the HPV vaccine ($n = 1$) were excluded, resulting in a final sample of 356 heterosexual men. Demographic characteristics are given in Table 1.

Procedure and Materials

After providing informed consent, participants completed a baseline survey. They were then given 5 minutes to read a 2-page intervention message on HPV infection and the HPV vaccine. Participants were randomly assigned to receive 1 of 2 intervention messages: a self-protection message or a self-protection and partner protection message. All participants received basic information about HPV infection including its prevalence, signs and symptoms, health consequences, risk factors, and methods for diagnosis, treatment, and risk reduction. The self-message described the consequences of HPV for men's health (genital warts, penile, and anal cancers), whereas the self-protection and partner message described the consequences of HPV for men's health plus their female sexual partner's health (cervical cancer, genital warts). Participants also received information about the quadrivalent HPV vaccine (Gardasil). The message stated that although the HPV vaccine is currently only available for women, it is likely to be available to men within the next few years. The self-message described how receipt of the HPV vaccine could help protect men from genital warts and anogenital cancers, whereas the self-message and partner message provided the same information as the self-message and a description of how male HPV vaccination could contribute indirectly to their female partner's health by reducing her risk of genital warts, abnormal Pap tests, and cervical cancer.

After exposure to the intervention, participants completed a posttest survey. Upon completion, participants placed their survey packet in sealed envelope for privacy. After debriefing, participants received a fact sheet on genital HPV infection from the CDC. Data were collected September through December of 2007. The study was approved by the University Institutional Review Board.

Measures

The baseline survey assessed demographic and sexual history information (whether they had ever had sexual intercourse, age at first intercourse, number of lifetime sexual partners, whether they had a current sexual partner, and STI-testing history). HPV aware-

TABLE 1. Descriptive Statistics for Demographics, Behavior, Awareness, Knowledge, and Health Beliefs ($n = 356$)

Variable	n (%) [*]	Mean (SD)
Age (18–24)		18.8 (1.2)
Hispanic or Latino	49 (14)	
Race		
White	298 (84)	
Black or African American	16 (4)	
American Indian or Alaska Native	1 (<1)	
Asian	7 (2)	
Native Hawaiian or other Pacific Islander	4 (1)	
Mixed race	11 (3)	
Other race	13 (4)	
Not reported	6 (2)	
Yr in college		
Freshman	221 (62)	
Sophomore	90 (25)	
Junior	29 (8)	
Senior	16 (5)	
Relationship status		
Not dating	124 (35)	
Single, but dating	131 (37)	
Single, but in a committed relationship	98 (28)	
Married	2 (<1)	
Not reported	1 (<1)	
Ever had sex	273 (77)	
Age at first intercourse		16.5 (1.3)
No. lifetime sexual partners		3.7 (5.8)
Have current sexual partner	163 (46)	
Ever tested for STIs	58 (16)	
HPV awareness	295 (83)	
HPV vaccine awareness	180 (51)	
HPV knowledge (posttest)		7.5 (1.2)
Perceived likelihood of HPV infection		2.2 (1.3)
Perceived severity of HPV infection		5.2 (0.9)
Perceived effectiveness of HPV vaccine		4.8 (1.0)
Perceived benefits of HPV vaccine		4.5 (1.3)
Perceived barrier: hassle of HPV vaccination		3.8 (1.5)
Perceived barrier: cost of HPV vaccination		4.1 (1.4)
Perceived barrier: safety of HPV vaccine		4.6 (1.3)
Self-efficacy to receive HPV vaccine		4.1 (1.4)
Descriptive norm: my friends will get vaccinated		3.2 (1.5)

^{*}Percentages may exceed 100% because of rounding error.

ness (whether participants had ever heard of HPV) and where participants had heard about HPV were also assessed. The posttest survey assessed HPV vaccine awareness (whether participants had heard of the HPV vaccine before participating in the study), health beliefs, and HPV vaccine acceptability. HPV knowledge was assessed on both the baseline and posttest survey with 9 items (true, false, don't know) drawn from previous research.^{31,33} Knowledge items are given in Table 2. Participants received 1 point for each correct answer. "Don't know" responses were coded as incorrect. Points were summed to create prescores and postscores.

TABLE 2. HPV Knowledge: Number (Percent) Answering Correctly at Baseline and Posttest

Item	Baseline n (%)	Posttest n (%)
HPV can cause herpes. (F)	87 (24)	184 (52)
Genital warts are caused by HPV. (T)	98 (28)	326 (92)
Genital warts are caused by the herpes virus. (F)	80 (23)	140 (39)
There is a vaccine to prevent HPV infection that is available for women. (T)	142 (40)	266 (75)
Most people with genital HPV have no visible signs or symptoms. (T)	192 (54)	339 (95)
People can transmit HPV to their partner(s) even if they have no symptoms of HPV. (T)	268 (75)	348 (98)
Having multiple sexual partners increases a person's risk of getting HPV. (T)	312 (88)	353 (99)
HPV can cause cancer of the penis or anus in men. (T)	83 (23)	347 (98)
Vaccines to prevent HPV infection for men are under development. (T)	137 (39)	349 (98)

T indicates true; F, false.

Health beliefs were drawn from previous research^{19,33,34} and rated on a 6-point scale (1 = disagree strongly to 6 = agree strongly), unless otherwise indicated. Perceived susceptibility to HPV infection was assessed with 2 items: how likely is it that you will get genital HPV (a) in the future? and (b) in the next 10 years? (1 = very unlikely to 6 = very likely; $\alpha = 0.90$). Perceived severity of HPV infection was assessed with 3 items: having genital HPV would be (a) very upsetting, (b) disruptive to my health, and (c) disruptive to my romantic relationships ($\alpha = 0.84$). Perceived effectiveness of the HPV vaccine was assessed with 2 items: the HPV vaccine (a) will protect people from getting HPV and (b) will be effective in preventing genital HPV infection ($\alpha = 0.82$). Perceived benefits of the HPV vaccine were assessed with 2 items: getting the HPV vaccine (a) may be a good thing to do for my health and (b) will give me peace of mind about my health ($\alpha = 0.81$). Perceived barriers to HPV vaccination were assessed by asking participants to indicate the extent to which various factors would prevent them from getting vaccinated in the future (1 = not at all to 6 = very much). The first barrier (hassle) was assessed with 2 items: if it took a lot of (a) effort and (b) time to get vaccinated ($\alpha = 0.92$). The second barrier (cost) was assessed with 2 items: having to pay a lot for the vaccine; if health insurance would not pay for the vaccine ($\alpha = 0.79$). The third barrier (perceived safety) was assessed with a single item: How safe do you think it is to get the HPV vaccine? (1 = somewhat risky to 6 = very safe). Self-efficacy to receive the HPV vaccine was assessed with a single item: I am confident in my ability to get the HPV vaccine. Descriptive norms for HPV vaccination were assessed with the statement: many of my male friends will get vaccinated for genital HPV.

Men's intentions to receive the HPV vaccine were assessed using 5 items from previous research^{30,34}: "how likely is it that you will: (a) try to get more information about, (b) consider getting, (c) make it a priority to get, and (d) actually get the HPV vaccine once it is available." Participants also rated (e) the likelihood they will get the HPV vaccine if a health care provider offered it to them in the next 3 years (1 = very unlikely to 6 = very likely). The 5 items were averaged to create a composite representing HPV vaccine acceptability ($\alpha = 0.94$).

Statistical Analysis

Means, standard deviations, and percentages were computed for all potential predictors. A mixed design analysis of variance was conducted to assess changes in HPV knowledge from baseline to posttest by condition. Analysis of variance was used to assess effects of experimental condition (self = 0; self and partner = 1), relationship commitment (single and dating or not currently dating = 0; married or single, but in a committed relationship = 1), and their interaction on HPV vaccine acceptability. Correlations between potential predictors and HPV vaccine acceptability were estimated, controlling for experimental condition. To identify independent predictors, variables correlated with HPV vaccination intentions at $P < 0.05$ or better were entered simultaneously into a multiple regression analysis predicting HPV vaccine acceptability, while controlling for experimental condition.

Results

HPV Awareness and Knowledge

Eighty-three percent ($n = 295$) of respondents had heard of HPV. The majority (58%) heard about HPV from a health education class, television (47%), or a friend (33%). About half (51%) indicated they had heard of the HPV vaccine. HPV knowledge at baseline was limited (Table 2). There was considerable confusion between genital warts and genital herpes and less than 25% were aware of the connection between HPV and anogenital cancers in men. Knowledge scores increased substantially from baseline ($M = 3.93$, $SD = 2.20$) to posttest ($M = 7.45$; $SD = 1.21$), $F(1354) = 893.6$, $P < 0.001$, but this increase did not vary by condition ($P > 0.25$). At posttest, some confusion remained about the relationship between genital warts and genital herpes; however, the percentage of participants with correct answers increased to nearly 100% for most items.

HPV Vaccine Acceptability

Men's intentions to receive the HPV vaccine were moderately high and did not vary by experimental condition (self: $M = 3.93$; $SD = 1.40$ vs. self and partner: $M = 3.78$; $SD = 1.52$). Contrary to predictions, presenting men with the benefits of the HPV vaccine for their female partner(s) did not increase vaccine acceptability over and above presenting them with the benefits to men alone; nor did effects of this manipulation depend on whether men were currently in a committed relationship (all P values > 0.15).

Predictors of HPV Vaccine Acceptability

Potential predictor variables included demographic characteristics, behavior, HPV awareness, HPV vaccine awareness, posttest HPV knowledge, and health beliefs. See Table 1 for descriptive statistics. Correlations between potential predictors and HPV vaccine acceptability (controlling for experimental condition) are provided in the first column of Table 3. No demographic correlates were identified. Higher levels of HPV vaccine acceptability were associated with being sexually active, having a current sex partner, having more lifetime sex partners, and receiving a previous STI test. Awareness of HPV, awareness of the HPV vaccine, and HPV knowledge were all positively correlated with vaccination intentions. Significant correlations with vaccine acceptability were observed for all health beliefs except perceived severity of HPV infection.

Independent predictors of HPV vaccine acceptability included sexual activity, perceived susceptibility to HPV infection, per-

TABLE 3. Correlates and Independent Predictors of HPV Vaccine Acceptability

Variable	Partial Correlation*	Standardized β Weight [†]	Squared Partial Correlation [‡]
Demographic variables			
Age	0.02	—	—
Hispanic/Latino	0.09	—	—
Non-White	0.07	—	—
Yr in college	0.06	—	—
Committed relationship	0.07	—	—
Behavior			
Ever had sex	0.29 [§]	0.11 [¶]	0.02
No. lifetime sexual partners	0.18 [§]	-0.07	0.01
Have current sexual partner	0.19 [§]	0.03	0.00
Ever tested for STIs	0.17 [¶]	0.04	0.00
Awareness of HPV	0.16 [¶]	0.07	0.01
Awareness of HPV vaccine	0.23 [§]	0.03	0.00
HPV-related knowledge	0.15 [¶]	0.04	0.00
Health beliefs			
Perceived likelihood of HPV infection	0.25 [§]	0.14 [§]	0.04
Perceived severity of HPV infection	0.02	—	—
Perceived effectiveness of HPV vaccine	0.26 [§]	-0.01	0.00
Perceived benefits of HPV vaccine	0.58 [§]	0.31 [§]	0.12
Perceived barrier: hassle of HPV vaccination	-0.33 [§]	-0.18 [§]	0.05
Perceived barrier: cost of HPV vaccination	-0.20 [¶]	0.10 [¶]	0.02
Perceived barrier: safety of HPV vaccine	0.26 [§]	0.03	0.00
Self-efficacy to receive HPV vaccine	0.60 [§]	0.25 [§]	0.08
Descriptive norm: My friends will get vaccinated	0.56 [§]	0.26 [§]	0.09

*Partial correlations with HPV vaccine acceptability controlling for experimental condition.

[†]Variables correlated with HPV vaccine acceptability at $P < 0.05$ or better were entered into a multiple regression analysis predicting vaccine acceptability, controlling for experimental condition. Variables not meeting inclusion criteria are indicated with a dash.

[‡]Proportion of total variance in HPV vaccination acceptability that is explained uniquely by a given predictor variable after other variables in the model have been controlled.

[§] $P < 0.001$.

[¶] $P < 0.01$.

[¶] $P < 0.05$.

ceived benefits of the HPV vaccine, perceived hassle and cost of HPV vaccination, self-efficacy to receive the HPV vaccine, and the belief that one's male friends will receive the HPV vaccine (see the second and third columns of Table 3). These predictors accounted for 61% of the variance in HPV vaccine acceptability, $F(16,315) = 31.359$, $P < 0.001$.

Discussion

The current study is the first to examine HPV vaccine acceptability among young adult men since the FDA approved the HPV vaccine for women. Male heterosexual college students reported moderate interest in receiving the quadrivalent HPV vaccine. Contrary to predictions, informing men about the benefits of male HPV vaccination for reducing cervical cancer risk in their female partner(s) did not increase their interest in receiving the vaccine beyond informing them of the benefits for their own health. This was true even among men in a committed relationship.

It is unclear why comparable levels of vaccine acceptability were observed across the 2 conditions. Differences between the 2 intervention messages were perhaps too subtle to elicit differential levels of vaccine acceptability. It is possible that the self and partner protection message was not sufficiently effective in highlighting the potentially serious consequences of HPV infection for women. It is also possible that men already recognized the potential benefits of HPV vaccination for women before study entry. At baseline, three-fourths of the cases un-

derstood that they could unknowingly transmit an HPV infection to their partner and over half had previously heard of the HPV vaccine. Further research is needed to investigate the extent to which partner protection issues will play a role in HPV vaccination decision-making among men.

Correlates of HPV vaccine acceptability were generally consistent with those identified in previous studies of women.^{28,29} Sexual activity was the only unique behavioral predictor of HPV vaccine acceptability, such that sexually active men reported more interest in the vaccine than nonsexually active men. Whether young adult men are sexually active may prove to be an important self-selection variable for HPV vaccination. Although knowledge was correlated with vaccine acceptability, it did not uniquely predict vaccination intentions once other predictors were taken into account. Nevertheless, future campaigns targeting men will need to include basic information about HPV infection given men's relatively limited understanding of HPV.^{31,33,35}

HPV vaccine acceptability was uniquely predicted by several health beliefs including perceived susceptibility to HPV infection, perceived benefits of the HPV vaccine, and self-efficacy to receive the HPV vaccine. These findings indicate that future HPV vaccination programs targeting young adult men should emphasize the high prevalence of HPV infection and the benefits of HPV vaccination for their health. Men who believed that their friends will get vaccinated reported higher intentions to get vaccinated themselves, suggesting that peer behavior may play an important role in HPV vaccine uptake among young adult males. As observed in previous

studies,^{28,29} perceived barriers were identified as a potential roadblock to HPV vaccination. Perceived hassle of completing the 3-shot series and high vaccine expense were associated with diminished vaccine interest. These findings underscore the need for continued efforts aimed at removing barriers associated with HPV vaccination.

Current HPV vaccination campaigns typically highlight the benefits of the HPV vaccine for women, for example, touting Gardasil as the “cervical cancer vaccine.” It is unclear what effect (if any) this message will have on men’s interest in the HPV vaccine. Do men, for example, consider HPV infection to be a primarily female health problem? Will men be willing to receive a vaccine if it is presented as a means of cervical cancer prevention? Future research is needed to examine these questions.

Campaigns promoting HPV vaccination among men may face additional challenges over and above campaigns aimed at women. Relative to women, men tend to be less knowledgeable about HPV infection.³³ In addition, some men may view the consequences of HPV infection as less likely and severe for themselves than for women,³¹ and thus could perceive HPV vaccination as unnecessary. Finally, because HPV screening is not an established clinical practice for men (unlike women), there may be fewer opportunities to encourage male HPV vaccination.

Limitations of this study provide important opportunities for future research. First, because the HPV vaccine is not currently licensed for men, we could not assess effects of the intervention messages on vaccination behavior. Once the vaccine is approved for men, it will be important to assess whether factors identified in the current study affect vaccine uptake. A second limitation is that the sample was limited to young adult men attending college, most of whom were white and freshman. Future studies should assess HPV vaccine acceptability among men in the general population, and also adolescent men and parents with male children. Given that the study was designed in part to assess the effects of exposing men to the indirect benefits of the HPV vaccine for their female partners, gay and bisexual men were excluded. Future studies should assess HPV vaccine acceptability among gay and bisexual men.

Thousands of US women between the ages of 9 and 26 have been vaccinated against HPV. Nevertheless, the greatest reductions in HPV-associated disease will be achieved only if HPV vaccination is also extended to men.^{13,14} The current study identified several factors that could prove critical in shaping men’s decisions to receive the quadrivalent HPV vaccine. These findings have potentially important implications for future vaccination campaigns targeting adolescent and young adult men.

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