



Original article

## Human Papillomavirus Vaccine-Related Risk Perceptions Do Not Predict Sexual Initiation Among Young Women Over 30 Months Following Vaccination

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Article history: Received February 21, 2017; Accepted September 7, 2017

Key Words: Human papillomavirus vaccines; Adolescent; Sexual behavior; Longitudinal study; Survey study

### ABSTRACT

**Purpose:** We examined longitudinally the relationship between human papillomavirus (HPV) vaccine-related risk perceptions and initiation of sexual activity among adolescent women over 30 months after HPV vaccination.

**Methods:** Participants included 91 sexually inexperienced women aged 13–21 years receiving the HPV vaccine who completed at least three of five study visits. At every visit, participants completed surveys assessing HPV vaccine-related risk perceptions (perceived risk of sexually transmitted infections [STIs] other than HPV, perceived need for safer sexual behaviors), and sexual initiation. Outcomes were sexual initiation and age of sexual initiation. Associations between risk perceptions and outcomes were examined using ordered logistic regression models for sexual initiation and interval censored survival analyses for age of sexual initiation.

**Results:** Mean age at baseline was 14.9 years (standard deviation [SD] 1.4). Most participants perceived themselves to be at risk of STIs other than HPV (mean scale score = 4.0/10; SD 2.1) and perceived a need for safer sexual behaviors (mean scale score = 1.5/10; SD 1.5). By 30 months, 65 participants (78%) initiated sex. Perceived risk of STIs and perceived need for safer sexual behaviors were not associated with sexual initiation or age of sexual initiation. Older age at baseline was associated with sooner sexual initiation ( $p = .02$ ) and older age at sexual initiation ( $p < .001$ ). Results of ordered logistic regression and survival analyses were unchanged when controlling for baseline age.

### IMPLICATIONS AND CONTRIBUTION

Among sexually inexperienced adolescent women vaccinated against human papillomavirus (HPV), perceived risk of sexually transmitted infections other than HPV and perceived need for safer sexual behaviors following vaccination were not associated with initiating sexual activity, further demonstrating that HPV vaccine-related risk perceptions are unlikely to lead to riskier sexual behaviors.

**Conflicts of Interest:** Dr. Mullins, Ms. Morrow, Dr. Ding, and Dr. Huang have no financial disclosures relevant to this research to report. Dr. Rosenthal serves as an unfunded co-investigator on an investigator-initiated grant from Pfizer. Dr. Zimet has been an investigator on investigator-initiated HPV grants funded by Merck and Roche, received travel funds from Merck to present research at a scientific meeting, and received an honorarium from Sanofi Pasteur for participating in an Adolescent Immunization Initiative meeting. Dr. Kahn has served as co-chair of two clinical trials of the HPV vaccine in HIV-infected individuals; these studies were funded primarily by the NIH, but Merck provided vaccines and immunogenicity testing. Dr. Mullins wrote the first draft of the manuscript. None of the authors received any form of payment to produce the manuscript.

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**Conclusions:** HPV vaccine-related risk perceptions were not associated with sexual initiation or age of sexual initiation, providing further support that HPV vaccine-related risk perceptions are unlikely to lead to riskier sexual behaviors.

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Since 2007, the U.S. Advisory Committee on Immunization Practice has recommended routine human papillomavirus (HPV) vaccination for 11- to 12-year-old girls and catch-up vaccination for 13- to 26-year-old young women [1]. However, rates of vaccination remain low. In one national study, only 63% of young women received one or more doses of the HPV vaccine and 42% completed the series [2]. Younger adolescent women are less likely to have initiated the series as compared to older adolescent women [2,3], and only 8% of young women are vaccinated in accordance with the Advisory Committee on Immunization Practice recommendations (series completion by age 12 and within 6 months of the start of the series) [4]. One possible contributing factor to these low vaccination rates may be concerns on the part of parents and/or clinicians that because HPV is a sexually transmitted infection (STI), vaccinated young women may feel protected against STIs and thus engage in riskier sexual behaviors, such as initiation of sexual activity [5,6]. Because of these concerns, as well as evidence that earlier initiation of sexual activity is associated with adverse health outcomes [7,8], it is important to understand if there is a relationship between HPV vaccination and sexual initiation.

One key factor influencing sexual behaviors is a person's risk perception, or one's perceived risk of a negative outcome related to performing a particular behavior [9,10]. For example, a person's perceived risk of pregnancy or STI influences his/her use of condoms. According to risk homeostasis theory, individuals adjust their behaviors to maintain an overall level of risk that is acceptable to them [11,12]. Thus, if someone feels at low risk of a negative consequence (such as feeling at low risk of STIs other than HPV due to having received the HPV vaccine), he/she may engage in riskier sexual behaviors to offset feeling more protected from STIs—thereby keeping his/her overall perceived level of risk the same. Although HPV vaccination offers protection against only one STI, vaccinated young women may inappropriately perceive themselves to be at lower risk of STIs other than HPV. Understanding whether post-HPV vaccination risk perceptions are associated with riskier sexual behaviors, such as initiation of sexual activity, is important to the design and implementation of interventions to help young women develop appropriate risk perceptions.

Prior studies have demonstrated no association between HPV vaccination and sexual behaviors and related outcomes, such as changes in rates of STI diagnoses, reported condom use, and other risky sexual behaviors [13–17]. To our knowledge, however, no studies have examined longitudinally the potential role of HPV vaccine-related risk perceptions in initiation of sexual activity among young women who are sexually inexperienced at the time of vaccination. Therefore, the aim of the current study was to examine associations between HPV vaccine-related risk perceptions (perceived risk of STIs other than HPV and perceived need for safer sexual behaviors following HPV vaccination) and both sexual initiation and age of sexual initiation over 30 months following HPV vaccination. We hypothesized that greater perceived

risk of STIs other than HPV and greater perceived need for safer sexual behaviors—both protective attitudes—would be associated with lack of initiation of sexual activity and older age of sexual initiation over the duration of the study.

## Methods

Participants for this analysis were drawn from a larger longitudinal study that enrolled 339 13- to 21-year-old young women who were consecutively recruited from an urban, hospital-based, adolescent primary care office [18]. All participants had received the first HPV vaccine dose within 2 days of enrollment. Participants were recruited from 2008 to 2010, and the study was completed in 2013. Mothers or female legal guardians of participants were invited to enroll in the parent study. Women who were 18 years of age or older provided consent; younger women provided assent and parental permission was obtained. Mothers provided consent for their own participation. Participants received compensation for their time: the young women received a \$15 gift card for the first study visit, \$25 cash for each of four follow-up visits, and an additional \$20 for completion of the 30-month study visit; and mothers received a \$15 gift card. The hospital institutional review board approved the study.

The current analysis includes the 91 young women who were sexually inexperienced at the baseline visit and completed at least three of five study visits (baseline, 2, 6, 18, or 30 months), including the first and last study visits; 53 young women who were sexually inexperienced at baseline were excluded from this analysis because they did not meet this criterion. Young women who were included in this analysis did not differ from those who were excluded in terms of age, race, ethnicity, insurance status, or substance use (lifetime history of smoking, alcohol use, or marijuana use). Immediately after receiving the first HPV vaccine dose, young women who enrolled in the study completed a self-administered paper survey. Risk perceptions—perceived risk of STIs other than HPV and perceived need for safer sexual behaviors—were measured in relation to receiving the vaccine; that is, for perceived risk of STIs other than HPV, “after getting vaccinated (the shot) against HPV... (1) I am less worried about getting a sexually transmitted infection or disease (STI or STD) other than HPV” (Table 1). At each follow-up visit, young women completed similar self-administered paper surveys that assessed HPV vaccine-related risk perceptions and whether the young woman had initiated sexual activity since the prior study visit. Mothers completed surveys at baseline. The survey items were informed by theories of health behavior, specifically the Theory of Planned Behavior [19] and the Health Belief Model [20]. Items and scales measuring knowledge and attitudes were adapted from surveys that were previously validated in adolescent women [18]. Primary predictor variables were HPV vaccine-related risk perceptions: perceived risk of STIs other than HPV and perceived need for safer sexual

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