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Low Uptake of Human Papillomavirus Vaccine Among Postpartum Women, 2006–2012

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Abstract

Background: Young adult women find it acceptable to be offered the human papillomavirus (HPV) vaccine postpartum. Little is known about the practice of administering the HPV vaccine during the postpartum period.
Materials and Methods: The Truven Health Analytics MarketScan Commercial Claims and Encounters database was used to develop a cohort of privately insured 18 to 26–year-old women with uncomplicated live-born pregnancies. Eligibility required no previous doses of HPV vaccine before delivery and continuous insurance enrollment from June 2006 through 1 year postpartum. Descriptive statistics were performed.
Results: A total of 51,913 women meet age and enrollment criteria, with 3912 (7.5%) having received any doses of vaccine before their delivery, leaving 48,001 women in this cohort. In the year postpartum, 861 women (1.8%) received any HPV vaccine. Of the women initiating the vaccine, only 337 (39%) completed the three-vaccine series. Women who received the vaccine, compared with women who did not, were younger (21 vs. 23 years old), more often the dependent to the insurance beneficiary (56% vs. 30%), and were more likely to have had an abnormal pap smear in the year prior (19.6% vs. 9.1%) or postdelivery (16.4% vs. 4.9). More women completed the HPV vaccine series when initiated within 2 months postpartum compared with women initiating the vaccine series >2 months postpartum (44% vs. 38%).
Conclusions: Postpartum women are eligible for the HPV vaccine, yet very few are receiving it. The postpartum period is a missed opportunity for administration of this cancer-preventing vaccine.

Introduction

In June 2006, the first human papillomavirus (HPV) vaccine was approved by the United States Food and Drug Administration (FDA) for the prevention of conditions caused by HPV types 6, 11, 16, and 18. Since that time, two other HPV vaccines have been released, which protect against infection with up to seven high-risk, or oncogenic HPV strains depending on the vaccine. If not already exposed to these virus types, the vaccine is 97%–99% effective in preventing high-grade precancerous cervical lesions.[1] In countries, where HPV vaccine uptake has been brisk and comprehensive, there have been decreased rates of high-risk HPV infections, abnormal pap smears, and high-grade cervical dysplasia or precursors of cervical cancer.[2]

In the United States, the rates of HPV vaccine initiation and completion are low. The Advisory Committee on Immunization Practices (ACIP) recommends vaccination of adolescents age 11–12 with a catch up period for females during the ages of 13–26.[3] Despite recommendations, in a 2013 nationwide survey of 2077 women aged 19–26 years of age, only 37% reported previously receiving at least one HPV vaccine.[4] Of the vaccinated women, almost half (43.5%) received it as young adults (18–26 years of age)[4]—highlighting the importance of the catch-up period as an opportunity for vaccination. Inadequate knowledge about HPV and the HPV vaccine is a significant barrier to HPV vaccination in young adult women and physician recommendation alone can have a significant effect on vaccine intention and uptake.[5–12]

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Prenatal care is a time when women are in frequent contact with healthcare providers, appropriately aged women are receiving cervical cancer screening, and the flu and tetanus, diphtheria, and pertussis (TDaP) vaccines are recommended and administered.[13,14] Although the HPV vaccine is not administered during pregnancy, it is safe to administer during the postpartum period and while breastfeeding. For women who have not previously received the HPV vaccine, the postpartum period may present an opportunity to vaccinate. Two studies have shown that women find it acceptable to be offered the HPV vaccine postpartum[15,16] and the majority of those who are interested (95%) initiate the vaccine.[16] The extent to which eligible women are initiating HPV vaccination postpartum is unknown. Our objective is to estimate the proportion of vaccine-eligible women who initiate the HPV vaccine in the first year postpartum among a cohort of commercially insured women to evaluate potential missed opportunities for vaccination among women interacting with the healthcare system.

Materials and Methods

We used the Truven Health Analytics MarketScan Commercial Claims and Encounters database from 2005 to 2013. Data include monthly enrollment, inpatient, outpatient, and pharmacy service claims for over 50 million employees and their dependents. From this data we identified women ages 18–26 with inpatient services for uncomplicated live-born pregnancies delivered as a result of vaginal delivery or cesarean section (including multiples) from June 2006 to Dec 2012 (see Supplementary Appendix for codes; Supplementary Data are available online at www.liebertpub.com/jwh). The assigned delivery date was the service date of the last record for a live delivery. Among these women, we identified those who were continuously enrolled in a health insurance plan for 1 year before delivery and between June 2006 (the date when the HPV vaccine was introduced) and 1 year following their delivery date ($n = 51{,}913$). Women with evidence of HPV vaccination before delivery (healthcare common procedure classification codes: 90649 or 90650) were excluded ($n = 3912$). After all exclusions, there were 48,001 women eligible for analyses.

Measures

The outcome of interest was uptake of HPV vaccine during the year postpartum. We considered whether a woman had any HPV vaccine use (HPCS codes 90649 or 90650) and completion of the three vaccine sequence within 1 year of initiation among women who used the vaccine. Covariates included patient age, region (west, south, northeast, north central), relationship to plan holder (employee, spouse, or dependent of the insured), and the type of health as well as plan (health maintenance organization [HMO], preferred provider organization [PPO], or other) characteristics. Clinical characteristics of interest measured in the year before delivery included the presence of an abnormal pap smear, HPV diagnosis (any type and high-risk types), and cervical dysplasia. We also evaluated these outcomes in the postpartum year as well as general interactions with outpatient care and postpartum visit receipt.

Analysis

We estimate the proportion of women using the vaccine by year among all vaccine-eligible women. We describe the characteristics of women at their delivery date and compare health services utilization across subgroups of women based on their vaccine status (no vaccine, any vaccine receipt, and completion of three doses of vaccine). We used *t*-tests and chi-squared tests for continuous and categorical variable comparisons, respectively.

Results

Eight hundred sixty-one women (1.8% of women eligible) received any doses of HPV vaccine in the year postpartum and 337 women (39% of those who initiated the series and 0.7% of the total women eligible) completed the three-vaccine series. The rate of uptake of the HPV vaccine in the postpartum year from 2006 to 2012 was unchanged over time (Fig. 1).

Demographic characteristics of the cohort are included in Table 1. The average age of women in the cohort was 23 years old. Half resided in the south, with 27% in the north central United States and 16.7% in the west. Only 5% were in the northeast, consistent with the MarketScan Commercial Claims coverage. Sixty-five percent of women were part of a PPO and the others were divided equally between HMOs and other insurance coverage types.

The 861 women who received any doses of the HPV vaccine postpartum were younger ($p < 0.001$), with an average age of 21.7 years, than women who received no doses of vaccine. Forty percent of women who received any doses of the HPV vaccine postpartum, as compared with 19% in the entire cohort, were <21 years old ($p < 0.001$). Fifty-six percent of those receiving the vaccine were children or dependents of the health insurance primary beneficiary as opposed to 30% in the group of women who did not receive any vaccine ($p < 0.001$). Although statistically significant, distribution across region and insurance plan between the groups of women receiving and not receiving the vaccine were similar. Characteristics of women receiving three vaccines ($n = 337$) did not vary significantly from those of women who received only one dose of the vaccine (data not shown).

Three quarters of women in the entire cohort had cervical cancer screening with a pap smear before delivery (Table 2). Women who had a history of HPV vaccination in the year postpartum were more likely than those without vaccination

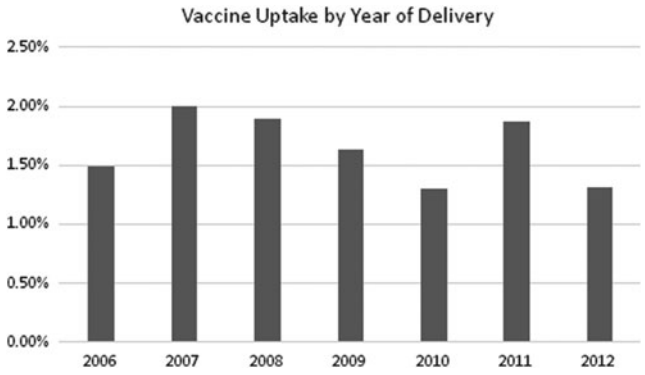

FIG. 1. Percentage of women initiating the HPV vaccine in the year postpartum by year of delivery. Note: 2006 starts with June 2006, the time at which the HPV vaccine became available. HPV, human papillomavirus.

Table 1. Cohort Demographics: Postpartum Women Without Any Prior Human Papillomavirus Vaccine Dose Aged 18–26 at Time of Delivery, MarketScan 2006–2013 (*N*=48,001)

	No vaccine in postpartum year	*Receipt of any HPV vaccine in the year postpartum*	p
Total No., *n*, (row %)	47,140 (98.2)	861 (1.8)	
Age at delivery			<0.001
Mean (SD)	23.4 (2.55)	21.7 (2.66)	
IQR			
Min., max.	18–26	18–26	
Median (25th–75th percentile)	24 (21–26)	21 (19–24)	
Age at delivery, *n* (%)			<0.001
<21	8637 (18.3)	340 (39.5)	
21+	38,503 (81.7)	521 (60.5)	
Region, *n* (%)			0.018
Northeast	2284 (4.9)	52 (6.0)	
North Central	12,845 (27.3)	204 (23.7)	
South	24,003 (50.9)	432 (50.2)	
West	7851 (16.7)	171 (19.9)	
Unknown	157 (0.3)	2 (0.2)	
Relationship of patient to employee, *n* (%)			<0.001
Employee	18,309 (38.8)	260 (30.2)	
Spouse	15,161 (32.2)	123 (14.3)	
Child/other	13,670 (29.0)	478 (55.5)	
Plan type, *n* (%)			<0.001
HMO	7790 (16.5)	188 (21.8)	
PPO	30,548 (64.8)	506 (58.8)	
Other/unknown	8802 (18.7)	167 (19.4)	

HMO, health maintenance organization; HPV, human papillomavirus; IQR, interquartile range; PPO, preferred provider organization; SD, standard deviation.

Table 2. Selected Cohort Characteristics: Postpartum Women Without Any Prior Human Papillomavirus Vaccine Use Aged 18–26 at Time of Delivery, MarketScan 2006–2013 (*N*=48,001)

	No vaccine in the year postpartum, n *(%)*	*Receipt of any doses of HPV vaccine in the year postpartum,* n *(%)*	p
Total No.	47,140	861	
Outpatient claims—year before delivery			
Any pap smear before delivery	36,161 (76.7)	702 (81.5)	<0.001
Abnormal pap smear	4293 (9.1)	169 (19.6)	<0.001
HPV diagnosis			
Any cervical HPV diagnosis	549 (1.2)	20 (2.3)	0.002
Cervical high risk HPV DNA	320 (0.7)	16 (1.9)	<0.001
Diagnosis of cervical dysplasia	975 (2.1)	39 (4.5)	<0.001
Procedures for cervical dysplasia			
Colposcopy	2342 (5.0)	107 (12.4)	<0.001
Other procedures[a]	190 (0.4)	8 (0.9)	0.017
Outpatient claims—postpartum year			
New diagnosis of abnormal pap smear in postpartum year	2321 (4.9)	141 (16.4)	<0.001
New diagnosis of HPV in postpartum year			
Any cervical HPV diagnosis	533 (1.1)	55 (6.4)	<0.001
Cervical high risk HPV DNA	361 (0.8)	45 (5.2)	<0.001
New diagnosis of cervical dysplasia in postpartum year	1005 (2.1)	95 (11.0)	<0.001
Attend any outpatient visit in postpartum year			
Attend postpartum visit	32,761 (69.5)	705 (81.9)	<0.001
Any other outpatient visit	14,379 (30.5)	156 (18.1)	<0.001

[a]Other procedures include: electro/thermal cautery of cervix, cryotherapy, laser ablation, loop electrode excisional procedure (LEEP), and cold-knife cone excision.

to have had a pap smear in the year before delivery (81.5% vs. 76.7%, $p<0.001$). The women who were vaccinated were more than twice as likely as those who were not vaccinated to have history of an abnormal pap smear in the year before delivery (19.6% vs. 9.1%, $p<0.001$) and to have had a diagnosis of any HPV type (2.3% vs. 1.2%, $p=0.002$).

In the postpartum year, there were a total of 2462 new cases of abnormal pap smears and 588 new diagnoses of HPV. The women who received the HPV vaccine were more likely to have a new diagnosis of an abnormal pap smear postpartum (16.4% vs. 4.9%, $p<0.001$) or new diagnosis of HPV (6.4% vs. 1.1%, $p<0.001$) compared with women who did not receive the HPV vaccine. The number of women who completed the three-vaccine series is small, but similar (data not shown).

Seventy percent of women attended a postpartum visit with their obstetrical care provider (Table 2). The group of women receiving the HPV vaccine postpartum had slightly higher attendance rates at the postpartum visit (83%), but fewer other outpatient visit types compared with women not receiving the vaccine ($p<0.001$).

The median number of days from delivery to first dose of vaccine among those receiving the vaccine was 150 days (range: 3–365 days) or $\sim$5 months after delivery. Of those completing the vaccine within a year of the first dose, the median number of days to completion was 188 (range: 61–360 days). Eighty percent of women initiated the vaccine after 60 days. There was a higher rate of completion of the three-vaccine series if the vaccine was initiated within the first 60 days postpartum, although this was not statistically significant. Forty-four percent of women who initiated the vaccine within 60 days of delivery completed the three-vaccine series compared with 38% of women who initiated the vaccine after 60 days ($p=0.160$).

Discussion

Based on our data of young adult women in this large commercially insured cohort, very few eligible women received the HPV vaccine in the year postpartum, <2%. Just over 1/3 of those women initiating the series completed all three vaccines. Compared with women who did not receive the vaccine postpartum, women who were vaccinated were younger and more likely to have already had HPV exposure as demonstrated by higher rates of abnormal pap smears, HPV diagnoses, and resultant procedures before delivery and in the year postpartum.

Young adult women are among those most at risk of acquiring HPV infection.[17] The ACIP recommends the HPV vaccine during adolescence because it is most efficacious if it is administered before the onset of sexual activity and exposure to the vaccine-type HPV strains.[18] Additionally, adolescents have a more robust immune response to the vaccine than when received as an adult.[18] However, because the majority of adolescents are incompletely vaccinated,[19] it becomes important to promote uptake and completion of the HPV vaccine during the catch-up period.

Despite being sexually active, the majority of young adult women will not have acquired any of the oncogenic HPV subtypes.[20] In our cohort, 14.4% of the population had an abnormal pap and 2.4% had abnormal HPV testing. Women who received the HPV vaccine postpartum were more likely to have had an abnormal pap smear. This may reflect that abnormal testing motivated provider recommendation for vaccination or individuals with abnormal testing were more accepting of the vaccine. Regardless, it is equally important to vaccinate women who have not had abnormal testing. These may be women who have not had prior exposure to vaccine-type HPV strains and would receive full benefit from vaccination.

Prenatal care providers are missing opportunities to administer this cancer-preventing vaccine. Currently, there are no clinical guidelines recommending the vaccine postpartum. If indicated, cervical cancer screening is performed early in pregnancy. This is a time when women should also be screened for previous receipt of the HPV vaccine. Provider recommendation for HPV vaccination is associated with increased vaccination[7,12] and prior research suggests that women find it acceptable to be offered and receive the HPV vaccine postpartum.[15,16] For any pregnant woman who has not received the vaccine before pregnancy, administration postpartum should be recommended and offered.

In our study, 77% of women had cervical cancer screening in the year before delivery and $\sim$70% of women attended a postpartum visit. Fewer than 20% of the women who received any vaccine received the first dose in the 2 months postpartum, which suggests that it was not received at a postpartum visit. Our data suggest that prenatal care providers are not utilizing the opportunity to offer the HPV vaccine during pregnancy and administer the HPV vaccine postpartum.

In a recent study, only 36.9% of young adult women report receiving one or more doses of HPV vaccine.[21] In contrast, only 8.6% of women in the current study received the vaccine before delivery. Seeing oneself as low risk for HPV acquisition is a perceived barrier to receiving the vaccine by both patients and providers.[5,10,22] In our study, women who did not receive the vaccine were more likely to be the spouse of the primary insurance beneficiary compared with the women who did receive the vaccine and, therefore, may have considered themselves low risk for HPV because they were married. Recommendation for vaccination is universal regardless of relationship status. Thus, pregnant women should not be excluded from consideration for the vaccine because they have already been sexually active or may be in a monogamous relationship.

Additional barriers to HPV vaccination include lack of knowledge about HPV, not having the vaccine offered by a provider, concern over safety and side effects of the vaccine, cost, and ability to make it to three vaccine visits.[5,6,9,11] Although these barriers cannot be evaluated in administrative data, it is interesting to note that insurance coverage expansion in 2010 appears to have had no impact on uptake among these women, although its intended effect is to reduce cost-related barriers to use. As of 2010, the Affordable Care Act mandated coverage of ACIP-approved vaccines at no cost for insured patients, and this includes coverage of the HPV vaccine.

Using a large claims-based database allowed us to look at what, unfortunately, was a rare outcome in this population—HPV vaccination. There are several important limitations to note. First, to ensure that women had not been previously vaccinated we required that they have continuous health plan enrollment from the time of vaccine availability through 1 year postpartum resulting in a large sample size loss. If

women received vaccines outside of their insurance, this would not be captured, although this is unlikely given the cost of the vaccine. Next, this database is made up exclusively of privately insured individuals, the majority from the South, and therefore represents a specific demographic and is not generalizable to all patients. Further research should look at practice patterns for HPV vaccination in populations that are uninsured or Medicaid insured. Finally, we were not able to evaluate reasons why women were not vaccinated postpartum and this requires further study.

We must improve processes and promote awareness to identify women eligible for HPV vaccination at the time of pregnancy and plan for vaccination postpartum. Examples of this include educating providers and other staff within offices on the appropriate use of the HPV vaccine, using the electronic medical record for prompts regarding vaccination, developing reminder systems for protocols to include HPV vaccine recommendation and administration, initiating patients, and developing novel ways for patients to access all three doses of the vaccine.[12,23,24] It would be worthwhile to determine if uptake of the vaccine was improved if women could access the vaccine more conveniently, for example, at a pediatrician's office or a pharmacy. Finally, cutting the cost of the vaccine for women without coverage could significantly improve uptake.[24]

Results from our study indicate that very few young adult women receive the HPV vaccine in the year postpartum. Prenatal and postpartum visits thus represent missed clinical opportunities to discuss HPV vaccination and, in the postpartum period, to administer the HPV vaccine.[25] While we would agree that vaccination in adolescence is best, clearly a large percentage of young adult women remain unvaccinated and would benefit from the vaccine. The postpartum period could be an ideal time to reach and vaccinate these women. We hope that by highlighting the missed opportunity to administer the HPV vaccine postpartum, practice patterns for screening, recommendation and administration of the HPV vaccine around the time of pregnancy will improve.

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Author Disclosure Statement

K.A.K.'s spouse is an employee of GlaxoSmithKline and has stock as part of his compensation package. All other authors have no competing financial interests.

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