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ABSTRACT
Purpose: The aims of this study were to review predictors of knowledge about human papillomavirus (HPV), HPV vaccine, and factors related to HPV vaccine uptake and report a quality assurance project that evaluated HPV vaccine uptake and three-dose completion rates.

Methods: The setting was a small private urban pediatric practice. Chart review was used to describe HPV vaccine uptake and dose completion rates in 2007. The convenience sample included 189 girls aged 12 to 21 years with HPV vaccine uptake.

Results: During 2007, 153 girls aged 12 to 17 years and 42 girls aged 18 to 21 years were seen at well child care visits. HPV vaccine uptake was 72% (n = 110) for the younger group and 79% (n = 33) for the older group. There was no significant difference in HPV vaccine uptake by group. One quarter (24%, n = 46) received the HPV vaccine dose at an episodic visit. The dose completion rate was 64% (n = 120).

Discussion: HPV vaccine uptake and dose completion rates were higher than rates reported by the Centers for Disease Control and Prevention. Effective strategies are needed to promote HPV vaccine uptake and dose completion. J Pediatr Health Care. (2010)

KEY WORDS
Human papillomavirus, HPV vaccine, quality assurance, parent/mother, knowledge/awareness, acceptance, intention/willingness

Cervical cancer is one of the most common types of cancer in women worldwide (Barnholtz-Sloan et al., 2009). Increased compliance with Papanicolaou (PAP) cervical screening in the United States has affected the early identification and treatment of cervical cancer, thus reducing its morbidity and mortality rates. Despite the positive effect that public health education has had on compliance with PAP screening, disparities in cervical cancer among non-White women persist (American Cancer Society, 2010). Although invasive cervical cancer rates have been reported to be on the decline for many races, Hispanic and non-Hispanic African American women have had a much higher incidence than non-Hispanic White women (Barnholtz-Sloan et al., 2009). These statistics signify the importance of reducing cultural barriers to screening and prevention of cervical cancer.

The majority of women have had abnormal results of a PAP smear at some point in their lifetime. Many of these abnormalities are related to human papillomavirus (HPV), a sexually transmitted infection that has been identified as a causative factor in cervical cancer. Multiple oncogenic strains of HPV have been identified, and two strains, HPV 16 and 18, cause 70% of cervical cancers...
The presence of HPV infection also has been associated with external condylomata, and HPV strains 6 and 11 have been found to be a causative factor in most of these lesions (Dunne et al., 2007). Higher HPV prevalence rates have been reported for non-Hispanic Black women compared with non-Hispanic White and Mexican American women (Dunne et al., 2007). Evidence-based educational interventions that are culturally sensitive have the potential to reduce disparities in rates of HPV infection and cervical cancer.

Both GlaxoSmithKline and Merck & Co have received Food and Drug Administration approval to license vaccines to prevent HPV infection. The Advisory Committee on Immunization Practices (ACIP) describes these two available forms of the HPV vaccine: Cervarix by GlaxoSmithKline, a bivalent vaccine that contains inactive strains 16 and 18 of HPV, and Gardasil, a quadrivalent vaccine by Merck & Co that contains inactive strains 16, 18, 6, and 11 of HPV (Middleman, 2007). Cervarix has been used in the United Kingdom as part of their national immunization program (Brabin et al., 2008) and has been available in the United States since fall 2009. Gardasil has been available in the United States since spring 2006. Both vaccines are available in a three-dose series for administration over a 6-month period to girls and young women aged 9 to 26 years. Furthermore, these vaccines have been reported to be safely administered in conjunction with other vaccines. Parental consent for administration of the HPV vaccine must be obtained prior to the age of 18 years in both countries. The Centers for Disease Control and Prevention (CDC) (2009a), the American Academy of Pediatrics (AAP) (AAP Committee on Infectious Diseases, 2007), and the ACIP (Markowitz et al., 2007) recommend offering the HPV vaccine routinely as part of the annual physical examination in girls aged 11 to 12 years. In response to these recommendations, a public health education campaign was initiated to encourage HPV vaccine uptake (Stanley, 2007).

Clinical trials have demonstrated that Gardasil has 100% efficacy to prevent HPV infection, if one is exposed to the virus, when the three-dose series is administered prior to coital debut (Markowitz et al., 2007). According to Markowitz and colleagues (2007), sustained immunity has been reported at 5 years and seems similar to long-standing immunity reports of the hepatitis B vaccine. Clinical trials also have shown that antibody responses are highest in girls aged 9 to 15 years (AAP Committee on Infectious Diseases, 2007). Reported adverse effects of Gardasil have included pain and redness at the injection site and dizziness with some episodes of syncope (Markowitz et al., 2007). Because the HPV vaccine is frequently given in conjunction with other vaccines, investigators have been unable to determine if syncope is directly related to the HPV vaccine.

Adolescent sexual behaviors have been studied for many years. Among adolescents aged 15 to 17 years, nearly one third reported ever having had sex (Gavin et al., 2009), and 39% reported having had sex during or prior to the 9th grade (U.S. Department of Health and Human Services, 2000). Additionally, adolescents in grades 9 through 12 have been known to practice risky sexual behaviors, including unprotected sex, with rates as high as 15% (U.S. Department of Health and Human Services, 2000). Increasing and alarming risk factors exist for adolescents with early age initiation of sexual activity as well. A high incidence of HPV infection exists in this age group, which can be attributed to such risk factors as physiologic immaturity, early sexual debut, multiple sex partners, and unsafe sex practices. Middleman (2007) reported that several studies found a high cumulative incidence of HPV infection in adolescents aged 13 to 16 years shortly after their sexual debut. Prevalence of HPV infection has been reported as being 25% in adolescents aged 14 to 19 years and 45% in young adults aged 20 to 24 years (Dunne et al., 2007). These statistics provide evidence of the likelihood of contracting HPV infection without the benefit of receiving the HPV vaccination as an adolescent or young adult.

In summary, the HPV vaccine is a primary preventive strategy to reduce the incidence of HPV infection and further reduce cervical cancer rates. Despite the benefit to risk ratio of the HPV vaccine, parents have expressed some hesitancy about having their daughters vaccinated. Understanding the factors that affect parental intention for uptake of the HPV vaccine by their daughters may suggest strategies to improve the HPV vaccine uptake rate. Utilizing culturally sensitive educational methods to promote this cancer-preventing vaccine can potentially reduce disparities in rates of HPV infection and cervical cancer.

The purposes of this article are to:

1. Review predictors of knowledge about HPV and the HPV vaccine
2. Review predictors of parental intention for uptake of the HPV vaccine by their daughters
3. Review provider factors related to uptake of the HPV vaccine
4. Describe a quality assurance (QA) project in a private practice to evaluate the HPV vaccine uptake rate (≥1 dose) and HPV vaccine three-dose completion rate and compare it with the HPV vaccine uptake rate and three-dose completion rate reported in the literature.

LITERATURE REVIEW

Predictors of Knowledge About HPV and the HPV Vaccine

Awareness of HPV and the HPV vaccine were studied in women aged 18 to 49 years using data from the National Immunization Survey (Jain et al., 2009). Eighty-four percent of the women were aware of HPV, with the greatest
awareness in those 18 to 26 years of age. In this study, both race and socioeconomic status were associated with awareness of HPV and the HPV vaccine. Hispanics and non-Hispanic African Americans were less aware of both HPV and the HPV vaccine. Older non-Hispanic African Americans were less aware of HPV and the HPV vaccine, whereas college-educated non-Hispanic African Americans had increased awareness (Jain et al., 2009). Younger age (Fazekas, Brewer, & Smith, 2008; Ogilvie et al., 2007) and older age (Di Giuseppe, Abbate, Liquori, Albanó, & Angelillo, 2008), White race (Jain et al., 2009), and higher levels of education (Jain et al., 2009) were associated with increased knowledge of HPV. Similarly, African American race, non-White Hispanic race, and manual workers were associated with decreased knowledge of HPV (Walsh et al., 2008).

Di Giuseppe et al. (2008) reported that predictors for having knowledge about HPV and the HPV vaccine included greater perceived risk of HPV, personal experience with cervical cancer, having a parent who was a health care provider, and having a doctor’s appointment in the past year in which the doctor provided information about the HPV vaccine.

**Predictors of Parental Intention for Uptake of the HPV Vaccine by Their Daughters**

Multiple studies have investigated the relationship between predictors of parental intention to vaccinate daughters and uptake rates of the HPV vaccine. A systematic review of 28 studies by Brewer and Fazekas (2007) reported predictors of intention for uptake of the HPV vaccine as well as various barriers to getting vaccinated. Brewer and Fazekas (2007) found a higher intention for HPV vaccine uptake when parents believed that HPV infection was more likely and the HPV vaccine was effective and recommended by the physician. Barriers related to intention for HPV vaccine uptake included cost and, for a small percentage of parents, the belief that the vaccine would promote sexual behaviors in adolescents.

A pre-licensure study investigated a group of women aged 18 to 30 years to identify attitudes and intention for uptake of the HPV vaccine by themselves and their daughters (Kahn, Rosenthal, Hamann, & Bernstein, 2003). Seventy percent of the women had accurate knowledge about HPV, and the majority had positive attitudes about the HPV vaccine for themselves and their daughters. Most of the women thought that the HPV vaccine was safe and did not believe that there would be increased risky sexual behaviors as a result of receiving the vaccine. Factors associated with higher intention to vaccinate included greater knowledge about HPV, greater personal and normative beliefs about the HPV vaccine, and increased number of sexual partners. Significant others’ support, primary care provider approval, and history of sexually transmitted infection also were associated with intention for uptake of the HPV vaccine.

Fazekas et al. (2008) reported on another pre-licensure study of knowledge, beliefs, perceptions, barriers, and cues to action related to intention for uptake of the HPV vaccine in a predominantly African American population in the rural southern United States with high rates of cervical cancer. Eighty-four percent of the mothers reported that they would vaccinate their daughters if the vaccine was free. Other predictors that significantly increased mothers’ intention to vaccinate daughters included increased knowledge and beliefs about HPV, HPV vaccine, and cervical cancer risk. Beliefs about the severity of HPV and HPV-related diseases, the likelihood of HPV causing cervical cancer, limited negative consequences of the HPV vaccine, and effectiveness of the HPV vaccine all increased mothers’ willingness to vaccinate daughters if the vaccine was not free.

Di Giuseppe et al. (2008) reported early post-licensure results about knowledge, attitudes, and intention for uptake of the HPV vaccine in a randomized sample of 1348 Italian female subjects aged 14 to 24 years. Fewer than one third knew that HPV was common and only half had heard of cervical cancer. Forty-two percent knew of a preventive vaccine, and for those who were positive about intention to vaccinate, 88% believed that the vaccine decreased the risk of HPV infection and cervical cancer. Predictors for intention for uptake of the HPV vaccine included increased number of sexual partners, greater perceived risk of HPV, needing more information about the vaccine, personal experience with cervical cancer, having a parent who was a health care provider, and having a doctor’s appointment in the past year in which the doctor provided information about the vaccine.

Barriers to uptake of the HPV vaccine also have been reported in the literature in multiple studies. Di Giuseppe et al. (2008) reported barriers such as concern about adverse reaction to the vaccine and decreased perceived risk for HPV infection. Keating et al. (2008) identified cost to patient and burden of insurance reimbursement as barriers. In a post-licensure study of Chinese females aged 13 to 20 years who received education via focus groups, a pre-test and post-test revealed safety and effectiveness of the vaccine as predictors of positive intention to accept the HPV vaccine, with the majority declining the vaccine if cost was a barrier (Kwan et al., 2008). Mothers who were more involved with their daughters’ peer group and who had daughters who did not resist having three injections also were more likely to express positive intention to accept the HPV vaccine (Rosenthal et al., 2008).

Sociodemographic factors such as race, education, and age have been described in the literature as factors related to intention for uptake of the HPV vaccine (Brewer & Fazekas, 2007; Di Giuseppe et al., 2008; Fazekas et al., 2008; Jain et al., 2009; Ogilvie et al., 2007). Marlow, Waller, and Wardle (2008) reported on
sociodemographic predictors of intention for HPV vaccine uptake in women aged 25 to 64 years. The majority (74%) of the women reported intention for uptake of the HPV vaccine for themselves and their daughters; race and socioeconomic status were not related to intention for uptake of the vaccine for their daughters. Sociodemographic factors associated with decreased intention for uptake of the HPV vaccine were reported as non-White (Walsh et al., 2008) and African American race (Fazekas et al., 2008). All of these sociodemographic factors should be considered when educating parents of girls who are younger than 18 years of age to obtain parental consent for this preventive vaccine.

**Provider Factors Related to Uptake of the HPV Vaccine**

Health care providers can greatly affect uptake of the HPV vaccine. Reports in the literature have identified both predictors and barriers related to health care providers’ recommendations. Keating and colleagues (2008) described health care provider concerns in a southern rural area of the United States. A telephone survey identified only 59% of health care providers who offered the HPV vaccine via the Free Vaccines for Children supply; non-providers believed that it was cheaper to refer patients because of concern about low uptake and vaccine expiration.

A post-licensure study stated that 78% of pediatric clinicians reported that they were extremely likely to recommend the HPV vaccine (Feemster, Winters, Fiks, Kinsman, & Kahn, 2008). Predictors of vaccine recommendations included providers who were early adopters of new technology and who anticipated parental concerns about safety and effectiveness of the HPV vaccine. Responses on a 6-month post-licensure survey of physicians, 52% of whom were women and half of whom were in private practice, were compared with responses from a 2004 Wall Street Journal online survey about the HPV vaccine completed by the general public (Ishibashi, Koopmans, Curlin, Alexander, & Ross, 2008). This randomized sample of physicians was more likely than the public to give the vaccine without parental permission and less likely to agree with the statement that PAP screening and abstinence programs were more effective than the vaccine for HPV prevention.

Another study described poor uptake of the HPV vaccine despite the provision of much support and preparation to nine physicians in a faculty-based gynecology practice in an urban setting (Jaspan, Dunton, & Cook, 2008). The office policy was to offer eligible women the HPV vaccine immediately after licensure, but the uptake rate was only 28.2%, and health care provider rates of recommendation varied. Five physicians had less than a 20% recommendation rate, and four had a recommendation rate higher than 20%.

Sussman et al. (2007) reported on a survey of primary care clinicians about anticipatory guidance regarding the HPV vaccine for adolescents. Facilitators of counseling about the HPV vaccine included building rapport and believing that adolescents are at increased risk for engaging in sexual behaviors. Barriers to counseling this age group included the high level of complex counseling that would be involved, a poor knowledge base, and provider discomfort with this low level of knowledge. Another barrier cited involved time constraints for the usual office visit (Sussman et al., 2007). Most office visits are completed in less than 30 minutes and must cover other complex topics for anticipatory guidance as well. A strong influence on counseling the young adolescent is the presence of the parent in the room during anticipatory guidance. Sussman and colleagues (2007) reported that the clinicians preferred to counsel adolescents about such sensitive topics with parents out of the room; however, the HPV vaccine typically is discussed with this age group with parent(s) present.

Tissot et al. (2007) described strategies that were identified by clinicians as crucial to effective counseling about the HPV vaccine. Strategies focused on developing office policies related to easy access to and administration of the HPV vaccine. Useful methods for vaccine delivery programs included office procedures to enhance the identification of eligible patients and procedures to promote dose completion, such as chart reviews, computer queries, and mailed and telephone reminders. Office procedures to initiate the first dose at 11 years and to schedule, remind, and follow-up on missed appointments for the second and third doses will ensure completion of the three-dose series by age 12 years as recommended by the CDC (Jacobson Vann & Szilagyi, 2009).

Strategies to promote vaccination such as screening tools and reminder systems are recommended. For example, Merck & Co. (2010) recommends key strategies in the examination room, at the reception desk, and after leaving the office to ensure completion of the three-dose series of Gardasil. Reinforcing and reminding parents in the examination room about the importance of follow-up for the second and third doses, scheduling appointments for the second and third doses at the reception desk, and using telephone, mail, or electronic reminders for scheduled appointments after leaving the office is supported by Merck & Co. through their complimentary provision of chart stickers, compliance sheets, and appointment reminder cards.

**Summary**

In summary, sociodemographic factors, such as White race and higher levels of education, as well as greater perceived risk of HPV infection, personal experience
with cervical cancer, and receipt of information about the HPV vaccine from a health care provider, were associated with more knowledge about HPV and the HPV vaccine. Predictors of parental intention for uptake of the HPV vaccine by their daughters included knowledge about HPV and the HPV vaccine as well as beliefs about the likelihood of contracting HPV infection, the likelihood of HPV causing cervical cancer, and the severity of HPV and HPV-related diseases. Other factors that predicted parental intention for uptake of the HPV vaccine included support of significant others, physician recommendations, and perceptions of vaccine safety and effectiveness. Factors relating to the reluctance of parents to vaccinate their daughters were cost, young age of the daughters, fear of promoting sexual activity, concerns about adverse reactions to the HPV vaccine, and concern about the long-term effectiveness of the HPV vaccine. Factors related to recommendations of the HPV vaccine by providers included barriers to counseling of preteen girls, such as poor knowledge base, time constraints, and presence of parents in the room. Factors that enhanced counseling by providers included having office policies and procedures for vaccine delivery and reminder systems to promote completion of the three-dose series.

QUALITY ASSURANCE PROJECT
Health care providers working in a private pediatric practice were preparing to submit an application for certification with the National Committee for Quality Assurance (National Committee for Quality Assurance, 2010) to be recognized through the Physician Practice Connections—Patient-Centered Medical Home. The application process involves an evaluation of practice standards that demonstrates use of updated information and systems to improve the quality of care in the practice. The health care providers had to choose several areas for evaluation, and given the recent availability of the HPV vaccine and recommendation for administration of the HPV vaccine to adolescent girls, the decision was made to evaluate the percentage of girls in the practice who had uptake of the vaccine and completed the three-dose series in the first year after its recommendation. The results of this evaluation would be used to develop methods to ensure that the HPV vaccine was offered to all eligible girls in the practice and to improve rates that were less than optimal.

METHODS
Description of the Practice
This quality assurance (QA) project used a descriptive design. The project was undertaken in a small private urban pediatric practice to examine the percentage of eligible girls who had uptake of the HPV vaccine and completed the three-dose series during the year of 2007. The practice includes one full-time board-certified pediatrician and two part-time board-certified pediatric nurse practitioners and has an active patient population of 2766. Ages of patients range from newborn through age 21 years. Demographics of the study population are shown in Table 1.

Participants
The practice policy was to offer the HPV vaccine during all office visits for eligible girls, including both well child care (WCC) and episodic visits (gynecologic and non-gynecologic appointments). Eligibility for the HPV vaccine was determined to be age 12 years or older. Exclusion criteria included known pregnancy (the CDC does not require pregnancy testing prior to the administration of the vaccine), moderate or severe illness, or hypersensitivity to yeast or any component of the vaccine. The HPV vaccine can be given to female clients who are lactating, are immuno-compromised, have minor acute illness, have had genital warts or an equivocal or abnormal PAP test, or have tested positive for HPV via the Hybrid Capture II High Risk test (CDC, 2009a). The pediatrician and nurse practitioners utilized typical office vaccination practices, including the provision of brief verbal education during which current recommendations for the HPV vaccine were provided following by provision of a standardized CDC Vaccine Information Sheet on the HPV vaccine to parents (CDC, 2009a). If parents declined the HPV vaccine for their daughters, a notation was made in the chart and the HPV vaccine was to be offered again at the next office visit. If parents agreed to uptake of the HPV vaccine, the first dose was given to their daughters and the parents were encouraged to schedule an appointment for administration of the next dose prior to leaving the office. No reminders were used to follow up on the second or third doses if they had not been scheduled, and no follow-up telephone calls or postcards were sent for second or third doses that were missed.

Data Collection
Methods of data collection included both computer query and chart review. A Web-based data management system is used in the office for electronic scheduling and billing. A query of this database identified the number of active patients who were eligible (N = 518) and the number who received the vaccine within two age cohorts: 12 to 17 years and 18 to 21 years. The unit of analysis for this project was the patient, and all patients were accounted for once they were in the data set as described in the following section. Data were collected on completion of the first, second, and third doses via a chart review by the nurse practitioner.

Data Analysis
Descriptive statistics were used to summarize the HPV vaccine uptake and dose completion rates. A $\chi^2$ analysis was used to examine the difference in proportions of
HPV vaccine uptake between younger and older age groups in the practice.

RESULTS
During 2007, 195 girls in the practice who were eligible for the HPV vaccine and had scheduled WCC appointments were offered the HPV vaccine during their office visit. The majority of the girls were aged 12 to 17 years (n = 153), and 42 girls were aged 18 to 21 years. During the review period, 73.3% (143/195) of the girls received the HPV vaccine during their annual WCC office visit. Uptake of the HPV vaccine in girls aged 12 to 17 years was 71.9% (110/153), and uptake of the HPV vaccine in girls aged 18 to 21 years was 78.6% (33/42). No significant difference in HPV vaccine uptake by age group was found ($\chi^2 = .448, P = .503$) (Table 2).

During the review period, a total of 189 girls who were eligible for the HPV vaccine and scheduled either a WCC or an episodic visit for acute or gynecological concerns received the HPV vaccine. A total of 75.7% (143/189) of the girls received the HPV vaccine at their WCC visit, and 24.3% (46/189) of the girls received the HPV vaccine at an episodic visit. Of the 46 girls with HPV vaccine uptake at an episodic visit, almost two thirds (65.2%; 30/46) were seen for non-gynecological concerns.

Dose completion rates also were examined during the review period. Of the girls with HPV vaccine uptake (n = 189), 63.5% (120/189) completed the three-dose series. Of the girls who completed the three-dose series, only 66.7% (80/120) of them did so within 12 months or less.

DISCUSSION
This QA project found an HPV vaccine uptake rate of 73.3% at WCC visits, which is higher than the rates reported by the CDC, but still in need of improvement. In 2007, the HPV vaccine uptake rate was 25.1% in adolescent females aged 13 to 17 years (CDC, 2008). In 2008, the HPV vaccine uptake rate in this population increased to 37.2% (CDC, 2009b). Kahn et al. (2008) reported a low HPV vaccine uptake rate of 5% in females aged 13 to 26 years. Jain et al. (2009) reported a low HPV vaccine uptake rate of 10% in women aged 18 to 26 years. In this older sample, factors associated with receiving the vaccine included being single, having adequate income, having insurance coverage, and receiving the hepatitis B vaccine. It is interesting that 34% of this older sample had received health care provider recommendations for the HPV vaccine. Of the 66% of the women who did not receive such recommendations, 90% of them reported that they intended to receive the HPV vaccine. In contrast, Marlow and colleagues (2008) reported that those who received the HPV vaccine stated that health care provider recommendations did not affect their decision making about uptake of the HPV vaccine. The HPV vaccine uptake rate in the QA project of 73.3% at WCC visits was somewhat similar to the rates of intention to receive the HPV vaccine (Marlow et al., 2008; Ogilvie et al., 2007).

Compared with the CDC reports, a United Kingdom study reported higher rates of HPV vaccine uptake; however, the HPV vaccine was part of a national

### TABLE 1. Demographics of study population

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>n</th>
<th>%</th>
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<tbody>
<tr>
<td>Population drawn from practice neighborhood*; †</td>
<td></td>
<td></td>
</tr>
<tr>
<td>African American race</td>
<td>72.5</td>
<td></td>
</tr>
<tr>
<td>Household income ≤ $14,999</td>
<td>43.2</td>
<td></td>
</tr>
<tr>
<td>Education ≤ high school</td>
<td>20.8</td>
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<tr>
<td>Population drawn from adjacent neighborhoods*; †</td>
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<tr>
<td>African American race</td>
<td>4.4-22.6</td>
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<tr>
<td>Household income ≤ $14,999</td>
<td>30.7-38.1</td>
<td></td>
</tr>
<tr>
<td>Education ≤ high school</td>
<td>26.3-30.3</td>
<td></td>
</tr>
<tr>
<td>Sex of practice patients</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>1020</td>
<td>36.9</td>
</tr>
<tr>
<td>Age of female practice patients</td>
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<td></td>
</tr>
<tr>
<td>12-21 y</td>
<td>518</td>
<td>18.7</td>
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<tr>
<td>Insurance of practice patients</td>
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<td></td>
</tr>
<tr>
<td>Private</td>
<td>2269</td>
<td>82.0</td>
</tr>
<tr>
<td>Public assistance</td>
<td>497</td>
<td>18.0</td>
</tr>
</tbody>
</table>

*Based on zip codes of the practice neighborhood and adjacent neighborhoods where more than one third of the patients in this practice reside.
†Vital statistics for these neighborhoods are from the 2000 census (Pittsburgh Department of City Planning, 2006).

### TABLE 2. Uptake of HPV vaccine during well child care visits by age groups

<table>
<thead>
<tr>
<th>Age group (y)</th>
<th>N</th>
<th>Yes n (%)</th>
<th>No n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-17</td>
<td>153</td>
<td>110 (71.9)</td>
<td>43 (28.1)</td>
</tr>
<tr>
<td>18-21</td>
<td>42</td>
<td>33 (78.6)</td>
<td>9 (21.4)</td>
</tr>
<tr>
<td>Total</td>
<td>195</td>
<td>143 (73.3)</td>
<td>52 (26.7)</td>
</tr>
</tbody>
</table>

HPV, human papillomavirus.
school-based immunization program (Brabin et al., 2008). Brabin and colleagues (2008) reported data from 36 schools with 2817 girls aged 12 to 13 years; 70.6% of the girls received the first dose of Cervarix, and 68.5% received the second dose. Completion of the series was negatively affected by the fact that 16% and 27% of the girls missed the first and second doses, respectively, resulting in rescheduling of appointments.

The QA finding of a three-dose completion rate of 66.7% within 12 months is only moderate but higher than the rate reported by the CDC (2009b), in which 17.9% of female adolescents aged 13 to 17 years completed the three-dose series. The CDC reported that among the adolescent girls with HPV vaccine uptake, 79.4% of them received the first dose in the previous 24 weeks; of these, 59.6% completed the three-dose series. This finding implies that there is a recent trend to complete the three-dose series now that the HPV vaccine is more established as a routine adolescent vaccination. Table 3 provides a summary of the rates of intention to receive the HPV vaccine and receipt of the HPV vaccine in this QA project and in the literature.

Implications for Practice
Although reports in the literature indicate that a moderately high percentage of mothers intend to receive the HPV vaccine for themselves and/or for their daughters, nationally reported HPV vaccine uptake rates have been disappointing (Table 3).

It is imperative to develop and test strategies to improve HPV vaccine uptake and dose completion rates. Use of appropriate educational strategies to promote health care provider ability to address patient and family knowledge gaps about HPV and the HPV vaccine in 5 minutes or less will help health care providers implement an effective office-based HPV vaccine delivery program. Educational strategies should target evidence-based predictors, such as seriousness of HPV infection and cervical cancer, susceptibility of adolescents to HPV infection, and risk of HPV infection.

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Implications for Research
A fair amount of evidence exists on HPV vaccine uptake rates and predictors of parental intention for uptake of
the HPV vaccine, but limited evidence is available about appropriate vaccine delivery programs to improve HPV vaccine uptake and series completion (e.g., Dempsey, Zimet, Davis, & Koutsky, 2006; Leader, Weiner, Kelly, Hornik, & Cappella, 2009). Early data on HPV vaccine uptake rates of the first and second doses in the United Kingdom were reported to be as high as 70% (Brabin et al., 2008), whereas U.S. reports are lower at 5% to 37% (CDC, 2008, 2009b; Jain et al., 2009; Jaspan et al., 2008; Kahn et al., 2008; Rosenthal et al., 2008), indicating a need for more studies of interventions to improve these rates in the United States.

Brewer and Fazekas (2007) found that education and age were predictive of intention for HPV vaccine uptake. Results were mixed for the effect of race on intention of HPV vaccine uptake (Brewer & Fazekas, 2007; Di Giuseppe et al., 2008; Jain et al., 2009; Ogilvie et al., 2007). Further investigations of culturally sensitive intervention strategies to improve HPV vaccine uptake and series completion need to be conducted. Development and testing of educational material in lay language about HPV and the HPV vaccine with emphasis on minority groups and lower levels of education are essential. Interventions that consider sociodemographic factors have the potential to decrease disparities in rates of HPV infection and cervical cancer.

An ongoing need exists for reports of uptake of the second and third doses of the HPV vaccine, along with appropriate educational strategies to increase HPV uptake and completion of the three-dose series. Development of educational strategies geared toward age-appropriate and parent-sensitive material can increase knowledge about HPV infection risk and prevention (Vallely, Roberts, Kitchener, & Brabin, 2008).

**CONCLUSIONS**

In conclusion, the office visit at 11 to 12 years of age is considered the primary immunization visit for adolescents, and a strong vaccine delivery program should be in place for this age group. Offices must take advantage of increased rates of adolescents presenting for WCC and the likelihood of health care provider screening for vaccines at this age. There is an increased likelihood that parents will agree to uptake of the HPV vaccine after receiving education and support from the health care provider. Educational initiatives should be in place to support health care providers and parents at this critical time, and all opportunities must be utilized to break down barriers to completion of this three-dose vaccine.

The National Vaccine Advisory Committee of the Department of Health and Human Services has accepted...
the recommendation of the Committee’s Adolescent Immunization Working Group to promote successful vaccination of adolescents in the United States (Southall, 2008). Developing evidence-based vaccine delivery programs based on what the Working Group has identified as six crucial issues will promote achievement of the goal of successfully vaccinating the adolescent population. These issues include sites for vaccine implementation, consent for vaccinations, communication strategies, financial considerations, surveillance, and possible school-based directives (Southall, 2008). Primary care providers should implement and evaluate evidence-based QA initiatives to improve HPV vaccine uptake and dose completion rates, thus reducing rates of HPV infection and cervical cancer.

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REFERENCES


