The HPV vaccine: a literature review examining the barriers to vaccination

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The HPV Vaccine: A Literature Review Examining the Barriers to Vaccination

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Introduction

Sexually transmitted infections are a major concern in the society in which we live today. According to a recent worldwide survey, there are around 18.9 million new cases of sexually transmitted infections each year (Weinstock, Berman, & Cates, 2004). The human papilloma virus (HPV) has the highest rates among all infections with approximately 20 million currently infected ("Centers for Disease Control and Prevention," 2008). It is estimated that approximately 6.2 million new HPV infections occurred in 2000 among Americans aged 15–44. Of these infections, 74% (4.6 million) occurred among 15–24-year-olds (Weinstock, et al., 2004). The lifetime risk of acquiring a genital HPV infection is estimated to be a staggering 80% while 50% of women contract a genital HPV infection within 2 years after becoming sexually active (Lenselink, et al., 2008). It requires skin to skin contact for transmission with a peak incidence soon after the onset of sexual activity. While most cases are asymptomatic and resolve spontaneously, small proportions of infections are persistent and can progress ("World Health Organization," 2008).

There are 100 types of the HPV virus that have been identified. Of this, 30 infect the genital area, including the skin of the penis, vulva, anus, and the linings of the vagina, cervix, or rectum. These are categorized according to their epidemiologic association with cervical cancer. The first group, considered low risk, can cause benign or low-grade cervical cell changes, genital warts, and recurrent respiratory papillomatosis. Type 6 and 11 are considered part of this group. The second group, considered high risk, can cause cervical cancer and other anogenital cancers. Type 16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59, and 66 make up the high risk oncogenic
group. It has been shown that high risk HPV DNA is found in 99% of all cervical cancers ("Centers for Disease Control and Prevention," 2008). Type 16 is the most common type at 50% of cases with type 18 being the second most common at 20% of cases (Stanley, 2008). These combined cause more than 70% of cervical cancer ("World Health Organization," 2008).

There are different pathology types of cervical cancer related to the human papilloma virus. A persistent HPV infection may lead to precancerous lesions involving the cervical glandular cells. It can either be moderate (2) or severe (3) cervical intraepithelial neoplasia (CIN) or adenocarcinoma in situ (AIS). CIN 2-3 has a high probability of progressing to squamous cell cancer while AIS has a high probability of progressing to adenocarcinoma. On average, it takes twenty years for cervical cancer to develop from the initial infection of HPV (World Health Organization, 2009).

The current detection for cervical cancer includes the Papanicolaou (Pap) smear and, sometimes, combined with HPV DNA testing. DNA testing is a recent addition and is not always utilized by healthcare professionals, however, 54% of youths aged 13-24 believe that HPV testing is routine (State of the nation 2005: Challenges facing STD prevention in youth, 2005). Cellular changes, as discussed above, can be detected by cytology using a microscopic examination of exfoliated cells from a pap test less than five years after the initial infection. However, recent clinical trials have demonstrated that conventional smears are only 70-80% sensitive and liquid based cytology is 85-90% sensitive for pre-cancerous cervical cells. The HPV DNA testing is primarily reserved for women who have atypical cells on their Pap smear. It can detect 13 of the
high-risk HPV types such as 16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59, and 68 (Hakim & Dinh, 2009).

Cervical cancer is the second leading cause of cancer in women worldwide (Stanley, 2008). There are 500,000 new cases and 200,000 deaths each year associated with this disease ("World Health Organization," 2008). In the United States alone, there are 10,800 newly diagnosed HPV-associated cases of cervical cancer with 3,850 deaths each year ("Centers for Disease Control and Prevention," 2008). This rate has fallen 75% since the 1960’s due to screening programs (Tsu & Levin, 2008). It has also been shown that 100% of cervical cancer, 40% of penile cancer, 40% of vulvular/vaginal cancer, and 90% anal cancer is a result of an HPV infection (Stanley, 2008).

In addition, cervical cancer has been studied among women of developing countries who do not have access to medical care and proper screenings. It has been shown that some of the highest rates are found in Latin America, Caribbean, sub-Saharan Africa, and Southeast Asia. In Tanzania, 68.6 of 100,000 women have cervical cancer and 87.3 of 100,000 women have cervical cancer in Haiti. The mortality rate from cervical cancer in most countries in Africa is around 80% while Switzerland has a mortality rate of 20%. Most cervical cancers diagnosed in Africa are in the advanced clinical stage and do not respond to the minimal treatment options that are available. In addition, only 5% of women in Africa have received a Pap smear, while close to 75% of women in developed countries have participated in some type of screening (Tsu & Levin, 2008).
Factors that contribute to the development of cervical cancer after an HPV infection include immune suppression, multiparity, early age at first delivery, cigarette smoking, long term use of hormonal contraceptives, and co-infection with Chlamydia trachomatis or Herpes simplex virus. In addition, Hispanics and African Americans have the highest rates of cervical cancer compared to other demographics ("Centers for Disease Control and Prevention," 2008).

Due to these unnerving statistics and a high correlation between HPV and cervical cancer, vaccines have recently developed to combat this virus. If given before a patient comes in contact with HPV, they work to produce antibodies to prevent an infection ("Centers for Disease Control and Prevention," 2008). The vaccines are prepared from virus-like particles (VLPs) that do not contain any live biological product or DNA so they are not infectious. It has been shown that antibody levels after immunization are 10 to 104 times higher than a natural HPV infection (Stanley, 2008). It has been shown that titres peak after the third dose, decline gradually, and then level off by 24 months after the first dose (World Health Organization, 2009). Also, antibody levels in adolescents are higher after immunization compared to older adults. Even the antibody levels measured in girls ages 9-11 are much higher than in girls ages 12-13, where researchers are seeing a decline one the child reaches puberty (Stanley, 2008).

However, the current minimum antibody protection is unknown however estimates have been made. Mathematical modeling related to the kinetics of antibody decay shows that protection may last for up to 30 years for HPV 16 virus like particles. More importantly, immune memory has been demonstrated with these vaccines which correlate to a high success rate and long term effects from the vaccination. Specifically,
recipients of the quadrivalent vaccine have been found to show a response to an HPV antigen 5 years after the vaccination while those who received the bivalent vaccine have been shown to maintain circulating memory B cells 1 month after the final shot. Although this shows promise, it is also important to recognize that the natural HPV infection induces B and T cell memory induction as well. In a similar light, HPV 18 antibody levels were studied 4 years after the final shot in the series. It was found that even though the antibody levels fell in 20% of the subjects, the efficacy against HPV type 18 remained at 100% while the placebo group showed constant attack rates (Stanley, 2008).

Currently there are two vaccines on the market: Gardasil by Merck & Co, and Cervarix by GlaxoSmithKline Biologicals. Gardasil or quadrivalent, which was developed by Merck & Co. is approved for use against HPV type 6, 11, 16, and 18. It has an efficacy rate of more than 96% in preventing high grade precancerous lesions and genital warts and an efficacy rate of 90% in preventing persistent infections (Stanley, 2008). Cervarix, or bivalent, only targets HPV types 16 and 18 ("Centers for Disease Control and Prevention," 2008). It has an efficacy rate of 90% in preventing high grade cervical lesions and a 75% efficacy rate in preventing persistent infections (Stanley, 2008). For each test participant, both vaccines created antibodies to HPV 16 and 18 following 3 doses. In addition, the bivalent vaccine has a higher capability of preventing HPV 45, 31, and 52 incident infection and the quadrivalent vaccine has capability of preventing some premalignant lesions resulting from HPV 45, 31, and 52. However, the bivalent vaccine did not show effectiveness against preventing CIN 2+ lesions caused by HPV 16 (Bornstein, 2009).
It has been shown that there is potential for cross coverage among other oncogenic HPV types that are genetically related to HPV 16 and 18, such as 31 and 45. With the quadrivalent vaccine, Gardasil, a study was conducted to determine this effectiveness. The results showed that 6 out of 10 vaccinations with Gardasil neutralized HPV type 45 and 8 out of 10 neutralized HPV type 31. Additional studies are being conducted to further examine this relationship ("World Health Organization," 2008).

Both of the aforementioned vaccines are approved for women ages 9-26. To provide the most coverage, the CDC suggests that all girls should receive the vaccine around the age of 11-12 or prior to sexual intercourse. All immigrants to the United States are required to have at least one dose of the vaccine (Jordan, 2008, October 1). If a girl is over the age of 13, she is able to get the vaccine but it will not provide coverage to a previous infection with HPV. The vaccine is a three dose 0.5-mL intramuscular injection over a 6 month period ("World Health Organization," 2008). After the initial dose, Cervarix is given at 1 month and 6 months where Gardasil is given at 2 months and 6 months (Stanley, 2008). It is important that all three doses are completed and the coverage is estimated to last for five years ("World Health Organization," 2008).

Because this vaccine is so new, there is limited data to determine its effectiveness against cervical cancer. There are many factors influencing the rate including age at infection, type of HPV contracted, and previous infection. Some experts estimate the effectiveness at a rate close to 100% for young women who have never been infected. According to a medical model completed in Brazil, if the vaccine has a
100% efficacy, it is safe to assume that the incidence of cancer will decrease by 43% with the vaccination alone. If this is combined with 3 screenings in a lifetime, the incidence of cancers will decrease by 61%. With only 3 screenings in a lifetime, the incidence of cancer is only decreased by 26% ("World Health Organization," 2008).

Despite this protection, in a phone survey conducted by the CDC, only 25% of females ages 13-17 have initiated the vaccination with no observable difference among age groups. Of these, 32.3% have received 1 dose, 44.2% have received 2 doses, and 23.5% have received all three doses. However, it is important to note that some respondents who received the first dose may not have had sufficient time to complete the series before the survey interview date. This is the first Advisory Committee for Immunization Practices (ACIP) survey related to the HPV vaccine so there are no data to compare with earlier years, however, their goal of 90% coverage seems unattainable at this point ("Centers for Disease Control and Prevention," 2008).
Barriers

Expenses

The cost of the vaccine is a very large barrier to many in the general population. On average, each dose costs $120 which means that a complete vaccine series totals US$360. This expense may or may not be covered by insurance, leading patients to never start or complete the series (Keating, et al., 2008). Manuafactures have declared they are willing to set different prices for countries with different economic conditions ("World Health Organization," 2008). Even though this is the most important negative influence discovered in a study among Canadian mothers, only 6.1% of them knew that the vaccine would cost more than 300 Canadian dollars (Lenehan, et al., 2008). Not surprisingly, another study found that 70.5% of participants believed the vaccine should be free (Walsh, et al., 2008). Similarly, 76% of parents in a study conducted in Sweden would give the vaccine to their children if it was free and only 63% of parents would give the vaccine if they had to pay for it (Lisen, et al., 2009).

In a study comprised of women from China 79% of the participants felt that the government should pay for part of the vaccine due to its high cost. 70% of women were willing to pay less than the equivalent of US$7 for the vaccine, which shows a large gap between the asking price and the acceptance price of the HPV vaccine (Li, et al., 2009). However, it is important to note that the average annual household income in the United States is $39,751 whereas China has an annual household income of $2900 (Chang, 2005, February 22). Due to this overwhelming rejection, Chinese people feel that either government programs need to help or pharmaceutical companies need to tier the pricing to afford more people the opportunity to become vaccinated (Li, et al., 2009).
Another presenting barrier is the lack of availability of the vaccine. There are two ways in which the vaccine can be supplied to an office. First, health care providers can privately purchase the vaccine to make it available to patients who can pay for it on their own or whose health insurance covers it. Second, they can stock the vaccine at the expense of the Vaccines for Children program that provides services to children who come from families who are not able to afford vaccines. This program covers children up to the age of 18 that are uninsured, underinsured, Medicaid eligible, American Indian, or Alaskan native. Providers have the option to choose either the first or second option or a combination of the two. According to a study completed in North Carolina, healthcare facilities do not typically stock the vaccine due to many factors, inadequate reimbursement being the most common at 68%. It was reported that sometimes insurance companies cover only slightly more than what the vaccine costs or they promise a different reimbursement than what they provide. In addition, high cost to patients (66%), burden of determining insurance coverage (66%), and high up-front costs of ordering and stocking (61%) were also large factors (Keating, et al., 2008).

Insurance coverage is yet another barrier in adolescents receiving the HPV vaccine. If the patient’s coverage does not include the vaccine or they have to go to a different health care facility to obtain the vaccine, they will most likely opt out of the services. Also, the family may be unaware of the Vaccines for Children program which will result in many children not getting vaccinated who actually qualify (Keating, et al., 2008). However, in a study completed in Kentucky, only 6.1% of people without health insurance rejected the HPV vaccine and 15% of women with health insurance were not
accepting of the vaccine. In addition, higher income households were less likely to accept the vaccine (Christian, Christian, & Hopenhayn, 2009).
**Side Effects**

It is always important to consider possible side effects when determining whether or not to receive a vaccine. Side effects can also be very worrisome for parents who, in most cases, are those determining if their child will be vaccinated. It has been shown that 94% of side effects are minor including headaches, fever, fainting, and nausea ("Centers for Disease Control and Prevention," 2008). In addition, patients have noticed pain, erythema, and edema at the injection site. Providers should consider a 15 minute waiting period after vaccination to watch for any of these effects.

On day 1-15 following any vaccination visit, 102 out of 21,464 subjects in a clinical trial reported serious adverse effects including bronchospasm, asthma, gastroenteritis, appendicitis, and pelvic inflammatory disease. However, it states that causality was not assessed. In the four year follow-up to this clinical trial, 5 subjects developed non-specific arthritis, 2 subjects developed rheumatoid arthritis, 1 subject developed juvenile arthritis, and 1 subject developed reactive arthritis. In the placebo group, 2 subjects developed arthritis and 1 subject developed systemic lupus erythematosus ("World Health Organization," 2008). However, in another clinical trial study looking at vaccination effects, there was no evidence of difference among the placebo group in respect to fatigue, headache, myalgia, gastroenteritis, arthralgia, fever, rash or urticaria (Hendrix, 2008).

Some adverse effects that have not been linked specifically to the vaccine but are still listed on the CDC website include Gillian Barre Syndrome, blood clots, and death ("Centers for Disease Control and Prevention," 2008). However, the Vaccination Adverse Event Reporting Database (VAERS) reports 4 cases of brachial nervous
events in the same arm that was vaccinated that is not explained by anything else (Debeer, De Munter, Bruyninckx, & Devlieger, 2008). In addition, 7 cases of anaphylaxis were identified in Australia and are deemed to be correlated with the HPV vaccine. The researchers state that the overall rates were extremely low and managed appropriately with no major long term side effects (Brotherton, et al., 2008). According to the FDA, there were no deaths related to the vaccine in the clinical phase trials ("World Health Organization," 2008).
Media Influences

Our society obtains a majority of its information from the media, whether it is the internet, television, or radio. Gardasil has been advertised through all routes of media and the process has been evaluated. In a study conducted to determine the relationship between media influence and vaccine acceptance, researchers found that 70.2% of mothers were accepting of the vaccine prior to the FDA approval and mass media coverage. This number has not changed greatly compared to studies being completed after the approval but this is still debatable. Also, mothers who were younger in age, did not have a college degree, and lived in a rural community were more likely to accept the vaccine (Christian, et al., 2009).

To complement the study discussed above, researchers examined the amount of media coverage surrounding the FDA approval of the HPV vaccine and if it affected the knowledge related to HPV and cervical cancer. They found that most of the media coverage was in May, June, and July of 2006, primarily surrounding the FDA approval of June 2006. When evaluating the sources, the found that cervical cancer was mentioned 50% of the time, STI was mentioned in 3.6% of the stories, and 78% of the articles mentioned that HPV was a STI. However, only 20% of the articles mentioned the need for routine cervical cancer screenings after vaccination. After analyzing their data, they found that 35% of the sample had knowledge related to the HPV and cervical cancer link in May of 2006 and it jumped to 52% by August of 2006. Males and individuals with less education were less likely to gain knowledge about the HPV vaccine over this time period (Kelly, Leader, Mittermaier, Hornik, & Cappella, 2009).
Although a majority of the advertising produced for Gardasil is accurate, false information about deaths associated with the vaccine can still be found on many popular internet search engines. Because of this, parents are potentially viewing incorrect information about the risks which is most likely another barrier to people receiving the vaccine. For example, CBS News reports of varsity athlete female who received the vaccine and is now no longer able to make it through the day without morphine. Her parents are responsible for this claim and medical doctors were not referenced in the article (Attkisson, 2008, July 8). On another website, the author makes reference to a law suit that involves many teenagers who developed seizures or muscle dysfunction due to the vaccine ("Gardasil Media and Adverse Reactions," 2009).
Parental Barriers

In many countries, parents believe that the vaccine is going to promote sexual intercourse to young teens and they are concerned about the risks of sexual disinhibition. Adolescents are having sexual intercourse at an earlier age and even more adolescents are having sex now, independent of their marital status and unknown to their parents. In a study conducted among parents of high school students, 84% did not believe that their child was sexually active. Although sexual activity rates have increased, the CDC also reports that condom use has increased since 1991. The effectiveness of condoms to prevent an HPV infection is still controversial because the condom is not able to protect all areas of the genitals that may allow transmission of the disease (State of the nation 2005: Challenges facing STD prevention in youth, 2005).

A study was conducted among 1620 mothers to examine the prevalence and predictors of the belief that the HPV vaccine will result in increased risky sexual behavior. It was found that 22.6% of mother thought that their daughter would be more likely to have sex after receiving the vaccination while 57.7% of mothers disagreed with this statement. 26.5% of mothers thought that their daughter would be more likely to have unprotected sex after the vaccination and 53.8% of mothers did not feel this way. The researchers also found that mothers from low income households that did not partake in regular cervical cancer screenings were more likely to believe that their daughter would become sexually active due to the vaccine (Marlow, Forster, Wardle, & Waller, 2009). Another study found that 77% of parents did not feel that the vaccine would cause their child to become more sexually active (Stretch, et al., 2008).
A study conducted with 116 mothers randomly picked in a clinic waiting room, showed that there are factors that influence the parental acceptance of the vaccine. The mothers who had no more than a high school education, had a sexually transmitted infection history, and who monitored their daughters more when with peers were more likely to be favorable about giving their daughters the vaccine. Even though it has been proven that daughters who have more parental supervision do not partake in sexual intercourse till later in life are the daughters who are getting vaccinated and more protection. This proves that parenting styles and vaccination attitudes affect the decision to vaccinate as opposed to the probabilistic assessment of risk based on the route of transmission. They want to provide the most protection to their child as possible in all aspects of life (Rosenthal, et al., 2008).

In addition, this study found the mother's age, race/ethnicity, self reported history of HPV disease, her age of sexual initiation, the daughter’s age, dating status, number of sexual topics discussed, sexual values, and the family environment did not influence the acceptance of the HPV vaccine. If the mother had a lack of intention to have her daughter receive the HPV vaccine, it was most often due to limited information about the vaccine and a lack of urgency due to the child’s young age (Rosenthal, et al., 2008). However, another study found that attitude did not differ significantly by social class, gender, or parental status (Walsh, et al., 2008).

In another study, researchers investigated why mothers refuse to have their daughters vaccinated. Mothers who declined the vaccine stated that they did not feel the HPV infection posed a great risk to their child, thought their child was too young for the vaccine, the medical establishment lacked knowledge on the vaccine, and they were
unsure of the long term effects from the vaccine. Although these seem to be insurmountable barriers to resolve, the researchers felt that the vaccine acceptability was possibly modifiable. The mothers stated that they would be more accepting of the vaccine if their daughter was older, sexually active, or safety information was more readily available (Dempsey, Abraham, Dalton, & Ruffin, 2009).

Another study in North Carolina, which looked at mothers ages 18-84 with an average age of 42, discovered interest in vaccinating their daughters was high regardless of whether the vaccine was framed as preventing HPV, cervical cancer, or genital warts. However, the highest acceptance was among preventing cervical cancer at 80%. Also, 84% of mothers were more likely to have their daughters vaccinated as opposed to 69% who would rather receive the vaccine themselves. This rate was the highest when discussing genital warts. With this being said, when counseling patients, it is important that they understand the relationship between HPV, cervical cancer, and genital warts. In addition, age had a factor in this study which found younger mothers had a higher rate of vaccine acceptance (Sperber, Brewer, & Smith, 2008). This was also a finding in a Canadian study among females ages 12-26 (Lenehan, et al., 2008).

A study conducted among Dutch parents looked at the knowledge related to HPV. Surprisingly, 29.5% of the parents had ever heard of HPV, 14.3% of parents knew about the relationship between HPV and cervical cancer, and only 6.2% of parents had heard about the HPV vaccine (Lenselink, et al., 2008). Researchers also reported that individuals were more likely to hear of the HPV vaccine if they were Caucasian, college educated, and had a household income of >$75,000 (Leader, Weiner, Kelly, Hornik, & Cappella, 2009). Even in the United States, 40% of women
have heard of HPV and fewer than 50% of these women knew that it caused cervical cancer (Lenehan, et al., 2008). In a different study in the United States, researchers found that 78% of women were aware of the vaccine (Jain, et al., 2009).

In addition to looking at the knowledge level in Dutch parents, the researchers found that parental knowledge, religion, age, education, and marital status did not influence the acceptance of the HPV vaccine. 87.9% of the parents would accept the vaccination if the Dutch government approved the use of the vaccine. With this being said, it is important to note that even though the subjects were very unfamiliar with HPV and cervical cancer, they were not opposed to vaccination. This reflects that HPV acceptance is more related to general vaccine acceptance and trust in the FDA and CDC with the clinical trials. The biggest fear among the other 12% was of the long term side effects that have not been studied at this point (Lenseink, et al., 2008).

In another English study, researchers investigated parental attitudes about the vaccine even when it was offered to their children as a vaccination program at school. 97% of the parents read the information sheet and 20% of these parents attended the information session. Of the parents who went to the session, 33% had received information from the television, 24% from the newspaper, 18% from the internet, and 6% from a health care provider. A majority of the parents felt that the information session was helpful in hearing other opinions, new issues, and found the discussions useful and enjoyable. Only 26% of parents from the information session felt that their decision was not influenced by the meeting. After the information sheet and session, it was found the 60% of the parents accepted the vaccine for their daughters. Parents
who refused were mainly concerned about short-term and long-term side effects, need for a booster, and compatibility with other HPV vaccines (Stretch, et al., 2008).
Medical Providers

In the study among mothers randomly picked in a clinic waiting room, mothers reported that the most important positive influence to have their daughters vaccinated was a doctor’s recommendation (Rosenthal, et al., 2008). In a Canadian study, 23.4% of the females indicated they intend to get the vaccine as soon as it comes available and 56.1% were neutral. In addition, only 12.1% of women intended to get the vaccine in the next five years. However, the researchers discovered that the women’s own attitudes were not predictive of their intention to be vaccinated; rather, they were more likely to listen to a doctor or someone they trusted (Lenehan, et al., 2008).

Another barrier to HPV vaccination that has not been studied extensively is physician’s attitudes and perception of barriers. According to a study, 60% of participating doctors admitted they schedule return immunization visit for adolescents ages 19-21 whereas 78% schedule return visits for 11-13 year olds. In addition, only 18% of family physicians and 28% of pediatricians use a tracking or reminder/recall system to identify and contact adolescents who were due or overdue for immunizations. If this number was much closer to 100%, HPV vaccinations would certainly be more widespread. It is also suggested that lack of medical school courses related to vaccination has influenced physicians to think less of these ideals (Adams, Jasani, & Fiander, 2007).

However, in a study that looked at a combination of 252 medical students and physicians ages 20-30, researchers found that 79.7% of participants would prescribe the vaccine to their patients. A majority (55.1%) would prescribe the vaccine between ages 10 to 15, 20.5% would prescribe it between 15 and 18 years, 14.1% would
prescribe it to children younger than 10, and 10.3% would prescribe it to patients over the age of 18. These rates are most likely due to the fact that 65.6% of participants believe that the HPV vaccine provides lasting immunity. Even more important, 80% of participants believe that adolescents could receive other vaccines at the same medical consultation and 93.9% agreed that it would offer a good opportunity to discuss sexually transmitted infections and AIDS (de Carvalho, et al., 2009).

Many research studies are finding that persuasion from a health care provider is proving extremely beneficial. In the Italian study, only 6% of participants said they get information from the primary care physician about HPV and cervical cancer (Di Giuseppe, Abbate, Liguori, Albano, & Angelillo, 2008). 90% even said they would get vaccinated if their provider recommended it (Jain, et al., 2009). In addition, 55% of Chinese women relied on the recommendations from their doctors to consider the HPV vaccine (Li, et al., 2009).

This study also looked at the barriers that physicians feel keep adolescents from obtaining the proper vaccinations. When discussing 11-13 year olds, 51% of doctors feel that adolescents do not make the proper preventative health visits, 54% do not feel adolescents understand the importance of vaccinations, 48% feel that adolescents underestimate the risk of disease, and 47% feel it is difficult to obtain previous vaccination reports from patients (Adams, et al., 2007).

In a similar study conducted among physicians, a Canadian study looked at the effect nurses have on a population when related to vaccination rates and knowledge. From the research, 97% of the nurses who were surveyed felt that the vaccines routinely recommended by the National Advisory Committee were extremely useful. For
the nurses who actually administered the HPV vaccine at their workplace, 90% were more likely to recommend it to patients whereas only 76% of nurses who did not give the vaccines were likely to tell patients about the vaccine. 93% of nurses would support the vaccination if it was publicly funded as opposed to 63% of nurses if clients had to pay (Duval, et al., 2009).

In addition to acceptance of the HPV vaccine, researchers from this Canadian study also looked at the knowledge among the nurses. When asked about their knowledge related to HPV, 59% of the nurses said they were not sufficient and 41% said they were somewhat sufficient. 74% of the nurses knew that cervical cancer is caused by an HPV infection but only 11% of nurses knew that conventional screening Pap tests have a sensitivity of more than 75%. 77% of the nurses knew that specific HPV genotypes are responsible for most anogenital warts. However, only 19% of the nurses knew that these warts induced by HPV are cervical cancer precursors (Duval, et al., 2009).
Recipient Barriers

Considering some adolescents will be making the decision to vaccinate themselves, it is important to look at the viewpoints coming from this population. In a study conducted among 16-19 year old females in the United Kingdom, researchers found some trends that are worth noting. 88% of the females felt that the vaccine was an effective way to prevent disease and 97% felt that the HPV vaccination would be a good way to protect them but 76% are worried about side effects. Besides this, 51% are very likely to accept the HPV vaccination and 38% are likely to accept the HPV vaccination. However, a quite alarming statistic was discovered in this study which states that 43% of the girls would be more likely to have sex or unprotected sex if they received the vaccine. This is an important issue that needs to be addressed to adolescents to ensure they know the risks associated with unprotected sex even if they have been vaccinated (Marlow, Waller, Evans, & Wardle, 2009).

College women were also studied among researchers to gain an insight from this age group. Of this group, 45% of the females planned to obtain the vaccination after 30 days from the interview, 8% planned to obtain the vaccine within 30 days, 12% had already received the vaccine, and 15% were undecided about the vaccine. Rates of acceptance were higher among females whose partners and peer group were supportive of the vaccine. Also, the more initiative a female took related to the vaccine, the more knowledge she had with current issues and benefits. Although these numbers are promising, the knowledge related to HPV was alarmingly low among some females. Only 55% of females knew that a person with HPV may need to have Pap smears more often than others, 27% thought that HPV can be cured with the right treatment, and 15%
thought that HPV is spread through skin contact as opposed to genital contact. Although females are accepting of the vaccination, it is important to increase the knowledge among females about HPV (Allen, et al., 2009).

Another study looked at the likelihood of girls ages 16-19 to change their sexual behavior after receiving the HPV vaccine. When asked, 23.2% agreed and 8.4% strongly agreed that the HPV vaccine would make girls more likely to have sex and 29.7% agreed and 7.8% strongly agreed that the vaccine would make girls more likely to have unprotected sex. When asked specifically about their own decisions, only 16.9% thought the vaccine would cause them to have sex and 8.4% would be more likely to have unprotected sex after receiving the HPV vaccine. In addition, a high HPV knowledge score was the only predictor that a female would not partake in sexual activity due to the vaccine. Once again, educational programs may be an effective way to minimize risk compensation behavior (Marlow, Forster, et al., 2009).

Adolescent acceptance is yet another barrier to vaccination. In a study conducted among rural adolescents, 72.9% of them said they trusted their doctor would keep their information confidential. Although this happens most of the time, rural adolescents were more concerned about being seen in the waiting room or at a testing facility. This information would then be relayed to their parents either due to concern about health risks or small town gossip. The community could be even as small that the receptionist is a close family friend resulting in privacy being almost non-existent. Young girls should not be embarrassed about their health condition and they should feel comfortable enough to tell their parents or ask for a vaccination (Di Giuseppe, et al., 2008).
In a study where the average age was 17 years old, researchers looked at the prevalence of HPV and the intention to vaccinate. 68% of the females tested positive for HPV while only 33% were positive for one type of HPV that the vaccine covered. 65% of women intended to get the vaccine and 5% had already received the vaccine. This study indicates that 30% of young women who are eligible for the vaccine do not intend to receive it. Also, they found the factors that predict the intention to receive the vaccine include: belief in others approval, increased knowledge of HPV, safety, younger age, health benefits, and increased perceived severity of HPV (Theroux, 2008).

To demonstrate the lack of knowledge among the adolescent and young adult world, 1,348 Italian females ages 14-24 were questioned about their knowledge related to the transmission and prevention of HPV. 29.1% of the females knew that HPV could be shared with incomplete sexual intercourse, 22.9% knew that HPV could not be shared through needles, and 34.8% knew that condoms could provide some protection from HPV. 29.8% of these women had heard of the HPV infection, 42.1% knew that the HPV vaccine can prevent cervical cancer, and 52.6% had ever heard of cervical cancer (Di Giuseppe, et al., 2008).

The Italian study further investigated the factors that influence the knowledge level of women. They found that older age, having at least one parent who is a health care professional, personal or friendly history of cervical cancer, and underwent a health checkup in the past year were associated with having higher odds of hearing about the HPV vaccine (Di Giuseppe, et al., 2008). In another study conducted throughout the United States, researchers found that younger age, living in a city, having medical insurance, and having received the Hepatitis B vaccine were all associated with
increased awareness (Jain, et al., 2009). The Italian study also looked at the factors influencing acceptance among individuals. 81.7% of the participants felt they would obtain the HPV vaccine in the future. They were more likely to accept the vaccine if they had a high perceived risk of contracting HPV or cervical cancer, they had a high belief that the vaccine prevents cervical cancer, and if they have at least one parent who is a health care professional (Di Giuseppe, et al., 2008).

To reiterate the fact that many people are not knowledgeable about the HPV vaccine, researchers in Birmingham, England interviewed 420 people ages 16-54. They asked 6 simple questions related to HPV and cervical cancer and found that 340 (81%) of the study participants had a knowledge score of 0 – no question was answered correctly. Even more surprising, the age group of 16-24 had 12.7% of people get above a knowledge score of 1 while the age group of 45-54 had 28% get above a knowledge score of 1. It seems that with increasing age, the population becomes more aware of the HPV vaccine. In addition, 21.8% of females achieved a knowledge score above 1 while only 14.5% of males were able to do this. However, no differences were noted among parents and non parents (Walsh, et al., 2008).

In Canada, a study was conducted to determine the barriers and knowledge of the HPV vaccine among females. Many interesting statistics were revealed in this study pertaining to the lack of knowledge about the HPV vaccine. Only 26.6% of females knew that the HPV vaccination was offered at both family practice settings and OBGYN settings. The remainder of the group thought it was necessary to go to a gynecologist practice to obtain the vaccine. If this is the case, then on average 75% of women are not getting vaccinated because they do not know where to go and they may even be
afraid to ask. In addition, only 16.3% knew the vaccine was for girls older than 9 years old. This is lack of information by the advertising companies and the other vaccination informative agencies. Parents need to be more informed so they can make proper decisions for the children (Lenehan, et al., 2008).

In addition to the above findings, this study also revealed that only 11.2% of females knew that the vaccine required more than one shot. Although many females obtain the first shot, the other two shots, which are required for proper coverage, may not be completed. That is close to 90% of females who start the vaccine but never complete it due to lack of teaching by the doctor or the lack of listening by the public (Lenehan, et al., 2008).

On a different note, much concern has been placed on the resulting complacency of a Pap smear due to the HPV vaccination. Many health care professionals are worried that women will feel this vaccine is the ticket to avoiding Pap smears the rest of their life. The Canadian study found that 69.4% of women either agreed or strongly agreed with getting the HPV vaccine despite the need to continue regular Pap screening and 81.6% of women agreed or strongly agreed that they would continue to get regular Pap tests even after the HPV vaccination. Although women are not quite knowledgeable on the HPV vaccine, they still understand the important need for cervical cancer screening (Lenehan, et al., 2008).

Surprisingly, a study found that a child’s dislike of needles has a negative influence on receiving the vaccination and is proving to be a cause for vaccine rejection. The process and the emotional reaction to a vaccine can be very stressful on both the child and the parent. If it is too much of a hassle to get the child into the doctor’s office,
they may forgo the vaccine all together (Rosenthal, et al., 2008). A survey conducted in
the United States found the 6% of people would not get the vaccination due to their fear
of needles (Jain, et al., 2009). It is important for health care professionals to address
the fear of shots as part of the counseling process to prevent this from happening
(Rosenthal, et al., 2008).
Racial Barriers

When looking specifically at race as a potential barrier, it is important to determine what differences might appear among different populations. Racial differences that present as a barrier to vaccination have not been studied extensively, however, a few studies found some differences that are worth noting. In a national survey of 7055 American respondents, in the category of women ages 18-26, Hispanic women were less likely to be aware of HPV compared to non-Hispanic white women. Among 27-49 year olds, non-Hispanic black women, Hispanic women, and women of other racial/ethnic groups were less likely to be aware of the vaccine compared to non-Hispanic white women. Hispanic women were also less likely to have received the vaccine but it was not statistically significant (Jain, et al., 2009). In addition, another study found that whites (23%) were more knowledgeable about the vaccine compared to nonwhites (8%) (Walsh, et al., 2008).

However, another study was completed in the United States that examined the differences of vaccine attitudes among 57 Latino and non-Latino women ages 18 to 55 years old. The two groups had very similar HPV vaccination acceptance at 92% although the Latino group reported a lower annual income and education level. 100% of the non-Latino women and 84.6% of Latino women were familiar with the vaccine. 79.4% of the Latino women and 34.1% of the non-Latino women received information about the vaccine from their health care provider. The non-Latino group was more likely to hear it from the television at 22.7% while no participant in the Latino group admitted to receiving information from the television (Watts, et al., 2009).
The researchers from the Latino study also found that non-Latino women were less likely to make changes to their sexual behavior. Only 10.9% of non-Latino women were going to try and make an improvement to be safer with their sexual practices while 46.2% of the Latino women admitted to trying to make a change. Only 3% of women from the study were going to stop using their safe-sex practices after the vaccination. This study did not examine the specific sexual behavior to determine the baseline severity but it is still significant to show a difference (Watts, et al., 2009).

A study was also conducted that looked at the differences between Caucasian and African Americans living in Pennsylvania and Virginia. In general, the findings suggested that Caucasians are more knowledgeable about the HPV vaccine compared to African Americans. On 8 out of the 10 questions that were asked, African Americans scored less than 70% while Caucasians only scored less than 70% on 5 out of the 10 questions. 81% of Caucasians and 64% of African Americans knew that HPV was sexually transmitted while 91% of Caucasians and 73% of African Americans knew the relationship between cervical cancer and HPV. 49% of African Americans and 81% of Caucasians knew that the HPV vaccine was approved for participants who have never been infected with HPV. However, it is universally alarming that only 65% of Caucasians and 54% of African Americans knew that both men and women could be infected (Ragin, et al., 2009).

Another study was completed that looked at the knowledge and attitudes among Chinese women living in rural and metropolitan regions of China. Only 15.5% of women had ever heard of HPV. Women 20 and over and living in a metropolitan area had more knowledge compared to women under the age of 20 and living in a rural area. The
researchers found that women who tested HPV negative, had a recent pap smear, had a history of cervical abnormalities, had a family history of cancer, had 12 or more years of education, had never smoked or drank alcohol, and had a hysterectomy were all at an advantage for understanding and being familiar with the HPV virus and vaccine. However, contraceptive use, number of partners in the past 5 years, and marital status were not associated with HPV knowledge among populations (Li, et al., 2009).

In addition, the study in China discovered that of the population that knew about the HPV vaccine, only 51.1% of metropolitan women and 41.6% of rural women knew that HPV was related to cervical cancer. Even more surprising, 8.1% of the respondents knew that HPV was related to genital warts. Although these numbers are quite low, 84% of the women were willing to be vaccinated primarily due to the scare of possibly being infected with the HPV virus and contracting genital warts. Of the females who had daughters, 86.4% were willing to vaccinate their daughters (Li, et al., 2009). Another study also found that students from an Asian background were less likely to accept the vaccine compared to students from white backgrounds (Dempsey, et al., 2009).
Preventing Barriers

The World Health Organization is a leader in providing public health information. It recently developed the Global Immunization Vision and Strategy (GIVS) to help with immunization rates around the world. It has 4 main objectives which include immunize more people against more diseases, introduce a range of newly available vaccines and technologies, integrate other critical health interventions with immunization. The organization also manages vaccination programs within the context of global interdependence. This provides a framework that many providers can follow when implementing new programs in their community. The goal is to save 10 million more lives in the timeframe of 2006 to 2015. Although this is a program designed to increase immunization rates among all vaccines, it is safe to assume that it will have a positive effect on HPV vaccination rates ("World Health Organization," 2008).

In addition to the World Health Organization, governments all around the world should implement policies to increase adolescent access to healthcare and ensure confidentiality to minors. Many of the national immunization registries should be expanded to include adolescents to ensure proper follow-up if a vaccination is missed. In addition, clinics can be started where there is a sharing of responsibility between nurses and physicians to help address the shortages being experienced in many countries. The government has control over many of these issues and should be used effectively to increase rates of the HPV vaccination ("World Health Organization," 2008).

As discussed before, underdeveloped countries are seeing the highest rates of cervical cancer due to the lack of screening and prevention programs. The HPV vaccine would be most beneficial to decreasing the rates of cervical cancer in a society
such as Africa because they could prevent women from even contracting the virus. However, government programs also have to step up in this arena to help fund the vaccine for the poorest countries. The GAVI Alliance has promised that it will provide 72 of the poorest countries the opportunity to pay only $0.15 - $0.20 per dose for the vaccine. This is very promising and the effects that it may have on cervical cancer rates is quite beneficial (Tsu & Levin, 2008).

As with many things in our society, communication is at times the best tool to inform the public about recent developments in the medical field. Health education programs are being utilized all around the world to increase the awareness of the HPV vaccine among patients, parents, health care providers, and health policy makers. In addition, partnerships across immunization, cancer control, adolescent health, and sexual and reproductive health are being formed to increase the communication. They need to start mass campaigns to reach the atypical target audience for vaccines. As seen with the tetanus shot, it is possible to inform the adolescent and adult public about the need for vaccination. For example, when a mother comes in for her routine cervical cancer screening, provide information about the need for HPV immunization of their children, other young female family members, and other young girls in their community ("World Health Organization," 2008).

It is important to stop this trend around the world but, more importantly, it is crucial to include educational programs associated with the HPV vaccine to ensure adolescents still understand the risks associated with unprotected sexual intercourse. It is even suggested that our society should discourage premarital sex as opposed to supplying a vaccine (Brabin, et al., 2008). For instance, a study in South Africa found that the fear
associated with this vaccination in relation to increased teenage sexual intercourse rate was diminished with proper counseling and education related to the vaccine (Harries, Moodley, Barone, Mall, & Sinanovic, 2009). Parents and family members have important roles to play and should be incorporated in prevention education (State of the nation 2005: Challenges facing STD prevention in youth, 2005).

In addition to the public gaining education on the HPV vaccine, it is important that all health care providers who come in contact with adolescents also receive information on the vaccine. The programs should encourage the need for vaccination, provide the administration directions, and list the possible side effects. It should cover who is able to receive the vaccine and the numerous benefits associated with it ("World Health Organization," 2008). It should act as a tool for adolescents to open the communication lines associated with the HPV vaccine for families who are too embarrassed to discuss the issue (Dempsey, et al., 2009). More importantly, physicians should be instructed to take every opportunity to vaccinate even if the child is in the office for an acute problem ("World Health Organization," 2008).

The physicians should also stress the importance of routine Papanicolaou tests even with vaccination. Cervical cell changes that need to be monitored can take place even with HPV vaccine. The public needs to be educated on safe sex practices and must not think that this shot will prevent all STI’s. Even the vaccine does not prevent against all types of HPV which many people might not know at this point. Adolescents should still be advised to wear condoms and delay sexual activity till they are older to decrease the chances of acquiring HPV (Walsh, et al., 2008).
These suggestions provide a good outline. However, it has been recommended to use the “5 A’s” system to help physicians become active leaders in the HPV vaccination program. The first A is “awareness.” Ask the parent/caregiver what they know about HPV and the available vaccine. “Assess” is the second A, which allows the physician to inquire about concerns related to the vaccine’s safety, side effects, efficacy, and effectiveness. The third A is “address,” which tells the physician to provide explanations and evidence based information using easy to understand language. The fourth A is “acceptability,” which relates to the issues expressed by the parent/caregiver, the type of insurance coverage, and financial situation of the family. “Activate” is the last A which happens if the family has decided to use the HPV vaccination. It is important that the physician reminds the patient and parent/caregiver about the need for 3 doses and provides a plan to help remember the follow-up dates (Cardarelli & Cardarelli, 2008).

Although these programs are developing, physicians are dealing with several complex issues that are preventing the vaccination rate to increase. For example, most adolescent vaccines are single dose boosters, whereas the HPV vaccine requires 3 doses to be effective. This may be difficult for the patient to understand the differing vaccination schedules ("World Health Organization," 2008).

Although the vaccine is costly to the patients and their insurance companies, models are predicting that it will actually be cost effective long term if combined with the proper cervical cancer screening procedures. This is especially true when screenings do not have to be completed as early in life or the frequency of screening is reduced due to the vaccine ("World Health Organization," 2008). It has also been shown that the HPV vaccine will be cost effective in countries where there is a high gross domestic product.
and in lower income countries if the vaccine costs less than $25 (World Health Organization, 2009). However, it is important to note that if vaccinated females are not screened till later in life, cervical cancer incidence and mortality will increase due to the waning of immunity over time. Health care professionals need to make their patients aware of the need for routine screening to prevent this from happening ("World Health Organization," 2008).

In addition to decreasing the screening schedule to help with the costs, providing the vaccine to the public will also help to avert the expenses associated with the virus. With the introduction of screening, many developed countries have been able to greatly reduce the cervical cancer deaths. In these settings, the vaccine will provide an increased reduction in mortality while also reducing the costs associated with abnormal screening tests, treating cancers, treating genital warts, and other HPV-related diseases. In contrast to developed countries, under-developed countries that do not have the screening capabilities are going to reap the most benefit in preventing cervical cancer deaths ("World Health Organization," 2008).

There are many ways to keep the cost down. For example, approving a two dose schedule would decrease the cost while also increasing the chance that adolescents will get each dose. If the vaccine could be given at an earlier age, possibly at school or infancy, the cost of vaccine delivery can be reduced. For instance, in South Africa, 95.5% of school-aged children are enrolled in primary schools and decreases with each year of school. If the vaccine was able to be given to younger females, the rates of vaccination in South Africa would increase (Di Giuseppe, et al., 2008). However, it is important to note that a study found 34% of people felt the vaccination was given too
early in life (Walsh, et al., 2008). If possible, it could be combined with other vaccines or a temperature-independent vaccine could be developed which would limit the storage costs.

A longitudinal study completed on females in grades 7-12 looked at different aspects that may predict future HPV infections. This is a unique study because they took females who tested negative for the virus and then followed them for 6 years. A total of 9% of the participants tested positive for at least 1 of the currently vaccination coverage HPV types during the final phase of the study. 53% of the participants who tested positive for HPV at the end of the study were virgins at the beginning of the study. No other factors, including low GPA, school problems, number of sex partners, age of sexual partners, parental influence, and use of drugs or alcohol had a strong correlation with a future HPV infection. With this being said, it is important that the HPV vaccination catch up program for teens over the age of 13 does not consider these risk factors when determining who qualifies for the program. Instead, they need to supply the vaccination to all eligible women no matter their history. They are not able to define high-risk populations and need to adopt a universal vaccination program to ensure coverage to everyone. In this sense, anyone who becomes sexually active is at risk for eventually acquiring this infection .(Dempsey, Gebremariam, Koutsky, & Manhart, 2008)

School based programs are the possible future for immunization among adolescents. In September of 2008, England instituted a program to help administer the HPV vaccine. They recognized the importance of prevention as opposed to treatment even though it will cost the country £100 million. All 12 and 13 year old girls will be offered the Cervarix vaccine at school which will cover around 300,000 girls each year.
Girls over the age of 13 will be offered the “catch up” vaccination in August of 2009. At this point, 148 out of the 152 Trust schools are part of the vaccination program, and 90% of the females are accepting the vaccine ("United Kingdom Department of Health," 2009). “Trust schools” are defined as foundation schools with a charitable trust that provides education for primary and secondary levels. The trust must be set up as a charity and is not allowed to make a profit from the school (Unison, 2009).

Although the public seems to be lacking in knowledge and access to the HPV vaccine, many studies have found that people are open to receiving information pertaining to the vaccine. For example, 94.4% of females in the Italian study wanted more information pertaining to HPV vaccination and 95.7% wanted more information about cervical cancer (Di Giuseppe, et al., 2008). However, a study completed among 16-54 year olds found that close to 90% of study participants would consent for their child to be vaccinated, but this number did not reflect their actual behavior (Walsh, et al., 2008).

The current vaccines on the market are being used to prevent an HPV infection and in turn protecting many individuals from cervical cancer. Some policy makers believe that the vaccine should not be marketed to prevent a sexually transmitted infection, rather advertise that it is a cancer vaccine. Parental and public opposition may decrease some due to the fear associated the word “cancer.” Hepatitis B is a disease that can be spread through sexual intercourse but parents do not see any problem with giving their children the vaccine to prevent this disease. In giving their children the vaccine, parents feel they are preventing their child from getting a serious liver disease.
This same ideal should hold true for the HPV vaccine. It is a way to prevent cancer and, in turn, a way to save a woman’s life (Harries, et al., 2009).

Researchers decided to look into this concept further by having each parent read different articles about the HPV vaccine. 63% of women intended to vaccinate themselves when the article only mentioned cervical cancer. However, only 43% of women intended to vaccinate themselves when the article talked about HPV being a sexually transmitted disease. These results were the same when deciding whether to vaccinate their daughters (Leader, et al., 2009).
**Vaccination of Males**

As stated above, HPV can cause penile, perineal, and anal cancer among men. More than 1,200 new cases of penile cancer are diagnosed each year as well as 2,000 new cases of anal cancer. It has been shown that 80-90% of anal cancer is caused by HPV, specifically type 16. A promising initial study completed by Merck showed that Gardasil has a 90% efficacy in preventing external genital lesions caused by HPV types 6, 11, 16, and 18 in men aged 16-26 years old. Due to the fact that men are believed to be the reservoir and vectors for this disease, vaccinating men could drastically reduce the number of HPV infections. Just as with females, the vaccine is only effective if given before any sexual contact. However, cervical cancer is far more prevalent among females compared to anal and penile cancer among males. In addition, cervical cancer shows up as an abnormal pap smear within 2-4 years where most men present with anal or penile cancer at ages 60-80. This will present the pharmaceutical companies’ marketing departments with a challenge to convince the population about the importance of vaccinating males. The direct results will take longer to see when vaccinating males compared to females (Chitale, 2009).

The safety of the vaccine in males has not been studied extensively; however the small amount of data provided is showing promising results. In a study conducted in Finland, 270 boys ages 10-18 were vaccinated with Cervarix and 97% of participants completed all 3 doses. The boys were tested 1 month after the last dose and 100% were found to have high antibody levels against HPV 16 and 18. Pain and swelling at the injection site was the most common local reaction and headaches, fatigue, and myalgias were the most common systemic reactions. However, these symptoms were
not severe enough to affect compliance with vaccination. Adverse events were very rare with only 0.8% of participants experiencing urticaria and 3.6% of participants developing a rash. This was not statistically significant from the control group. The frequency of unsolicited symptoms reported during the 30 day postvaccination period following each dose was similar between groups: 15.7% and 15.6% in the HPV 16/18 and control vaccine groups, respectively. There were no serious adverse events associated with the vaccine (Petaja, et al., 2009).

The FDA mathematical models have not shown a large decrease in cervical cancer rates in females if males were vaccinated which is why they have not approved the use at this point ("World Health Organization," 2008). A vaccine will not only directly protect individuals, but will also indirectly protect the population as a whole. The risk of coming into contact with an infected individual falls as more people are vaccinated. Due to this, epidemiologic modeling from other studies suggests that vaccination coverage would benefit from a gender neutral immunization program. The female-specific vaccination approach would be only 60-75% as efficient at reducing HPV prevalence in women compared to a gender-neutral vaccination strategy. In addition, our society would never consider treating only women for sexually transmitted infections when they are also transmitted to and by men (Kubba, 2008). In another study, researchers found that giving the vaccination to boys provided up to an 11% decrease in lifetime cancer risk depending on the coverage received from the vaccine (Kim, Andres-Beck, & Goldie, 2007).

77% of nurses from a Canadian study feel that all boys should be vaccinated before they become sexually active. Similarly, 70% of the nurses believe all boys
should be vaccinated. The difference seen in this study compared to females is small with 92% of nurses feel girls should be vaccinated before they become sexually active and 82% of nurses feel that all girls should be vaccinated (Duval, et al., 2009). In a study among physicians and medical students, 48% of participants would prescribe the vaccine to both males and females (de Carvalho, et al., 2009).

In the general population, a study among people ages 16-54 found that 91.2% of study participants felt that both males and females should be vaccinated (Walsh, et al., 2008). Similarly, in a study conducted among Swedish parents, 54% of parents to girls thought it would be necessary to vaccinate boys as well while 72.9% of parents to boys thought that girls should be vaccinated (Lisen, et al., 2009).

When looking at studies that compare vaccination rate among different races, Latino mothers were more likely to consider vaccinating their boys at 94% compared to non-Latino mothers at 77%. 85% of women from all ethnic backgrounds were in favor of vaccinating their boys with the primary reason to prevent penile and anal cancer. Mothers from this study were least likely to vaccinate their sons to prevent disease in females (Watts, et al., 2009).
Discussion

The HPV vaccine is extremely effective in preventing cervical cancer and genital warts, however, the review of literature proves that there are numerous barriers to vaccination. The expense and availability of the Gardasil vaccine seems to be interfering with the desire to become vaccinated. With the three shot series costing up to $360, recipients and guardians routinely cannot afford it. As shown by the research, parents would more likely give the vaccine to their children if it was free. In addition, each time one receives a shot, they most likely have to pay a co-pay as well. The United States current economic slump leaves less room for a family to spend outside of its already constricted budget, even if it compromises one’s health.

Mild medication side effects are extremely common in our society, such as headache, chills, or fatigue. When looking at the clinical trials from the safety of the Gardasil vaccine, it is apparent that serious adverse reactions are not able to be correlated with the vaccine. People will develop other diseases throughout their lifetime independent of any medications or vaccines. However, these adverse reactions are still listed on the CDC website although causality cannot be evaluated. Recipients of the vaccine, as well as parents, are reading this information resulting in incorrect information being passed along the general population.

Media is one of the strongest influences in the society that we live in today. In the case of the Gardasil vaccine, the media has not been able to change the acceptance rate for the vaccine and it has remained constant. However, the general population has becomes more knowledgeable about the link between cervical cancer and HPV, which hopefully will in turn increase the acceptance rates. As shown from the
research, advertising agencies should frame the vaccine as a cervical cancer vaccine, as opposed to a HPV vaccine. Parents are more accepting of a cancer prevention vaccine. However, many of the popular search engines are still advertising false information concerning deaths and other serious events associated with the vaccine. This is obviously not a benefit to the mass media.

The rate of acceptance among the recipients of Gardasil is close to 70%, however, their behavior does not reflect this rate. Only 25% of the potential recipients have received the vaccine. This is most likely due to the lack of knowledge and the perception that HPV is not a serious disease. Some people are unaware of where to get the vaccine and that they have to go back for 2 more shots after their first dose. If they chose to become vaccinated, they do not feel a strong need to change their behavior to prevent the transmission of sexually transmitted infections. Luckily, the majority of the population understands the importance of yearly Pap smears even with the vaccination.

Considering the vaccine is approved for children as young as 11 years old, parents are routinely involved in the decision making process. Many factors determine the final decision and barriers are met all along the way. Although this is the case, most research suggests that parents are generally accepting of the vaccine but there are some apparent opinions. Most parents do not believe their child will become more sexually active after receiving the vaccine, but they feel their child is not as risk for HPV and they are unsure of the long term effects of the vaccine. In addition, it is very apparent that most parents around the world are lacking in knowledge related to HPV and cervical cancer.
Medical Providers have a crucial role in boosting the number of vaccinations among the general public. They need to provide all the services to ensure that this happens, whether they distribute pamphlets or offer counseling at acute visits. The research suggests that medical providers are not doing their part to increase the rate of vaccination. The public is looking to the physicians for advice concerning the vaccine, but many times the public does not even know what questions to ask. All health care providers need to be as competent with the knowledge to better inform the population about HPV and the vaccine to prevent the infection.

Racial barriers were not discussed extensively throughout the paper as well as the vaccination of boys. However, it is important to note that Caucasian women were more likely to be knowledgeable about the HPV vaccine and to have received the vaccine compared to other minority groups. When considering the approval for vaccinating boys, research suggests that it can be extremely beneficial in decreasing penile, anal, and cervical cancer. Clinical trials have shown no issues adverse side effects in males. When given to boys, the vaccine will not only directly protect individuals, but will also indirectly protect the population as a whole.

There are many suggestions to increase the rates of vaccination throughout the world. The World Health Organization, as well as the country and state governments need to devise plans to facilitate this process. For instance, school based programs allow for parents to be involved and gain information while also providing the vaccine for the children without any doctors visits. In England, the population seems to be accepting of this policy and it could be the potential future for immunization programs around the world. Educational programs need to be devised and vaccine schedules
need to be condensed to ensure the convenience to the population. If they only have to receive one shot, the compliance rate will most likely increase.
Conclusion

Sexually transmitted infections are extremely common all around the world. We now have a chance to decrease the rates of HPV which, in turn, will decrease the rates of cervical cancer. However, many barriers prevent high vaccination rates. With these barriers identified through research studies, it is important that new policies are constantly developing. This is a job where everyone has a part and no one can go unnoticed. An enormous task lies ahead for the general public, health care providers and government officials, but, with the right tools, it can be accomplished. People are willing to listen; we only have to open the lines of communication.
References


Kelly, B. J., Leader, A. E., Mittermaier, D. J., Hornik, R. C., & Cappella, J. N. (2009). The HPV vaccine and the media: How has the topic been covered and what are the effects on knowledge about the virus and cervical cancer? *Patient Education and Counseling, 77*(2), 308-311.


Li, J., Li, L. K., Ma, J. F., Wei, L. H., Niyazi, M., Li, C. Q., et al. (2009). Knowledge and attitudes about human papillomavirus (HPV) and HPV vaccines among women living in metropolitan and rural regions of China. *Vaccine, 27*(8), 1210-1215.


Abstract

Objective: The purpose of this literature review was to examine the barriers that prevent females from obtaining the Human Papilloma Virus (HPV) vaccination and to provide possible solutions to combat these barriers.

Method: A self-guided search utilized the Center for Disease Control and Prevention and the World Health Organization, as well as the search engine PubMed and Medline.

Results: A total of forty-six articles evaluating the different perspectives towards the vaccine were referenced in writing this paper with special focus placed on the reliability and validity of the research, the statistical tests performed, and the source of the study.

Conclusion: Numerous barriers are preventing the vaccination rate to increase among females ages 9-26, including parental influence, poor media coverage, side effects, lack of knowledge, and poor coercion from the health care community. Programs and a stronger coalition for vaccination need to be established to ensure the decrease in rates of cervical cancer.