

**EXAMINING THE IMPACT OF HEALTHCARE PROVIDERS IN RELATION TO
GAINING PATIENT'S ACCEPTANCE AND INITIATION OF THE HPV VACCINE:
AN INTEGRATIVE REVIEW**

An Integrative Review

Submitted to the

Faculty of Liberty University

In partial fulfillment of

The requirements for the degree

Of Doctor of Nursing Practice

By

Millie Elizabeth Knox

Liberty University

Lynchburg, VA

August 2, 2021

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Scholarly Project Chair Approval:

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Date

Abstract

The human papillomavirus (HPV) is a prevalent virus and the most common sexually transmitted infection (STI) worldwide. Nearly 80 million people, approximately one in four, are currently infected in the United States (US). Given that HPV infections affects over 20 million Americans with possible life-threatening consequences, the importance of adhering to the recommended two-dose or three-dose vaccination series has a significant impact on cancer prevention.

Research studies have suggested that adolescents and young adults are at an increased risk of STIs and low HPV vaccination rates. For this integrative review, the target population was adolescents to young adults, ages 9-26 years. Education on the benefits of HPV vaccination has been key to increasing vaccination rates. Healthcare costs associated with preventing and treating HPV-related conditions in the US have been at least \$8.0 billion annually. HPV vaccines are the most effective and safest way to protect against HPV and a significant element in reducing future adverse health outcomes related to HPV. The Gardasil 9 vaccine is the recommended HPV vaccine, and it protects against the most high-risk strands of HPV, strands 16 and 18, plus several other high-risk strands that cause HPV-associated cancers and other abnormalities. The Centers for Disease Control and Prevention (CDC) recommends that males and females between the ages of 9 and 26 be offered the Gardasil vaccine to combat HPV-related infections and cancers. The primary purpose of this integrative review was to examine the impact of the vaccine provider in relation to gaining the patient's acceptance and initiation of the HPV vaccine. Implications from this project may influence healthcare organizations to make HPV Gardasil vaccination a priority.

Keywords: HPV, HPV vaccine, adolescents, prevention, education strategies, primary care providers (PCP)

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Table of Contents

Acknowledgments.....	4
List of Abbreviations	6
Section One: Formulating the Review Question	7
Background	8
Defining Concepts and Variables.....	9
Rationale for Conducting the Review	9
Purpose Statement.....	10
Conceptual Framework	11
Section Two: Literature Review	12
Information Sources and Search Criteria	12
Quality Appraisal	13
Synthesis of Literature	14
Section Three: Results	16
Themes of Individual Studies.....	16
<i>HPV Vaccination Hindrance</i>	16
<i>Educational Strategies</i>	28
<i>Compliance Strategies</i>	34
Synthesis of Results	37
Ethical Considerations.....	39
Timeline	40
Section Four: Discussion	41
Implications for Practice	45
Limitations	47
Dissemination.....	47
Summary	48
References.....	50
Appendix A: PRISMA Flow Chart.....	60
Appendix B: Level of Evidence Table.....	61
Appendix C: CITI Training Certificate.....	93
Appendix D: IRB Approval Documentation	94

List of Abbreviations

American Association of Colleges of Nursing (AACN)

Advisory Committee on Immunization Practices (ACIP)

American Cancer Society (ACS)

American Psychology Association (APA)

Appraisal of Guidelines Research & Evaluation II Tool (AGREE)

Burden of Disease Epidemiology, Equity, and Cost-Effectiveness Programme (BODE)

Centers for Disease Control and Prevention (CDC)

Community Preventive Services Task Force (CPSTF)

Cumulative Index to Nursing & Allied Health Literature (CINAHL)

Doctor of Nursing Practice (DNP)

Human Papilloma Virus (HPV)

Institutional Review Board (IRB)

Levels of Evidence (EOL)

Liberty University (LU)

National Foundation for Infectious Diseases (NFID)

Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA)

Primary Care Provider (PCP)

Scottish Intercollegiate Guidelines Network (SIGN)

Sexually Transmitted Infection (STI)

Section One: Formulating the Review Question

The Centers for Disease Control and Prevention ([CDC]:2019a) reports that human papilloma virus (HPV) infection is the most common sexually transmitted infection (STI), with nearly 80 million people currently infected in the US as of 2017. HPV-associated cancers occur in parts of the body where the HPV is located: the cervix, vagina, vulva, penile area, anus, and oropharynx. These cancers have become increasingly prevalent in the US. Health organizations like the CDC and Advisory Committee on Immunization Practices (ACIP) promote numerous strategies to increase HPV vaccination rates globally.

Over 45,300 HPV-associated cancers occur yearly in the US, including 25,400 among women and 19,900 among men (CDC, 2020). HPV infection risk increases when young adults are not adequately vaccinated with the HPV vaccine recommended during their adolescent period before a first sexual encounter. The CDC recommends HPV vaccination for males and females starting as early as nine years of age and extending until 26 years. The CDC considers the HPV vaccination series a preventive measure in decreasing certain HPV strains that cause cancer.

The number of cancer cases related to HPV infection can be eliminated by a patient receiving the recommended two-dose or three-dose HPV vaccine; however, many young adults fail to vaccinate in adolescence at the recommended age per CDC's ACIP committee. The HPV vaccine has been proven to be safe and effective against infections caused by the HPV virus; however, HPV vaccination rates have remained low, prompting healthcare providers to evaluate numerous campaign strategies to improve vaccination rates (CDC, 2020).

Background

As shown through various studies, research data on HPV infection acknowledges, that HPV infection is the most prevalent STI among late teens and young adults in the US. In 2018, the CDC reported that over 43 million Americans were infected with HPV and that there were 13 million cases of newly infections (CDC, 2021). The ACIP recommends males and females ages 9-14 years be vaccinated with two doses of the HPV Gardasil 9 vaccine and that individuals' ages 15-26 years be vaccinated with the three-dose series. In 2018, the HPV vaccine three-dose series completion rates averaged 56.8% for adolescent females and 51.8% for adolescent males (Elam-Evans et al., 2020). Completion of the HPV dose series before becoming sexually active is recommended by ACIP as a best practice. However, those who have become sexually active should, nonetheless, be vaccinated if they meet the age requirement.

Treatment costs of STIs and associated complications can be upwards of 16 billion dollars annually, of which HPV infections make up 755 million dollars (Chesson et al., 2021). With HPV infection being the most common STI, it is imperative to discover effective means to increase vaccination rates to improve the virus's complications. Vaccines licensed for use in the US are nine-valent (Gardasil), quadrivalent (Gardasil), and bivalent (Cervarix); however, only Gardasil 9 is currently available in the US. Gardasil 9 covers the most high-risk strains of HPV, strains 16 and 18, plus several other high-risk strains that cause HPV-associated cancers. Gardasil 9 has been proven to be safe and effective in preventing cervical cancer and other HPV-related problems, thus decreasing healthcare costs related to HPV complications and saving lives (Meites et al., 2019).

Statistics indicate that anogenital HPV infection is the most common STI among young adults and a leading causative agent in many types of HPV-related cancers. HPV vaccination

coverage among adolescents aged 13 to 17 years with greater than one dose of HPV vaccine increased from 68.1% in 2018 to 71.5%, and the percentage of adolescents who vaccinations were up-to-date increased from 51.1% to 54.2% in 2019 (Elam-Evans et al., 2020). The National Immunization Survey-Teen survey reported in 2019 that HPV vaccination rates had improved from earlier years; however, disparities existed, making HPV vaccination a priority among adolescents and young adults.

Defining Concepts and Variables

The conceptual definition of the risk for HPV-associated cancers among young adults was the lack of HPV vaccination uptake recommended by the CDC for adolescents and young adults ages 9-26. The variables consisted of strategies used to accept, initiate, and complete the HPV vaccination series among children and young adults. Concepts for this integrative review consisted of providers' role in promoting the HPV vaccine along with HPV vaccination initiation and compliance among the population identified for this review.

Rationale for Conducting the Review

Various research studies have suggested a knowledge deficit about HPV infection, prevention of HPV infection, and perceived safety and efficacy of the HPV vaccine are the main reasons for adolescents and young adults not being vaccinated. Treatment costs of HPV infections could cause a substantial burden on the healthcare delivery system in the future. With the number of HPV-infected young adults, healthcare leaders may need to develop and implement an HPV vaccination strategy to increase HPV vaccination and vaccination completion rates among children and young adults.

Purpose Statement

The purpose of this integrative review was to examine the impact of the provider in relation to gaining a patient's acceptance of the HPV vaccine and its subsequent initiation. The expected outcome of the integrative review was 1) identification of evidence-based strategies in the literature healthcare providers use to gain patient' acceptance of HPV vaccine initiation and 2) ability to provide recommendations for future practice. Additionally, the project leader sought to identify best practices that providers can employ to assist with patient compliance and completion of the HPV vaccine series.

Clinical Question(s)

The clinical question for this integrative review was formulated as follows: What is the impact of the provider recommendation in relation to gaining a patient's acceptance of the HPV vaccine and its subsequent initiation? Two broad project goals that served as the foundation for the clinical questions included the following:

- 1) To determine if there is evidence supporting provider strategies to increase patient's acceptance and initiation of the HPV vaccine.
- 2) To investigate best practices providers can employ to gain patient's compliance and completion of the HPV vaccine series.

Inclusion and Exclusion Criteria

The studies considered included articles written in English, and published between 2011 and 2021, that included children and young adults aged 9-26 years. Criteria assessed through an initial search of articles included articles were full-text, evidence-based, peer-reviewed, clinical, and had national guideline recommendations. Additional inclusion criteria were articles that

presented information about increasing HPV vaccination rates, barriers to HPV vaccine uptake, and provider' interventions that increased HPV vaccination rates.

Exclusion criteria were articles that were written in any languages other than English, articles dated before 2011, and articles about ethnic subgroups. Additionally, unpublished manuscripts, letters to the editor, short articles, abstract-only articles, uncompleted clinical trials, podium speeches, articles that did not address the specific issue of education, and articles that had not gone through the peer-review process were excluded. According to Whitemore and Knafl (2005), researchers should allow for the simultaneous inclusion of experimental and non-experimental research for integrative reviews to fully understand a phenomenon of concern.

Conceptual Framework

This integrative review utilized Whitemore and Knafl's methodology (2005) as a guiding framework to provide organization and structure to the information gathered and presented on strategies used by providers to gain a patient's acceptance of the HPV vaccine and its subsequent initiation. This type of methodology allowed for a wide array of research evidence to be examined and explored about HPV vaccination increase among young adults. Whitemore and Knafl's (2005) strategies to enhance rigor in integrative reviews were applied to this review and comprised the following five concepts: problem identification stage, literature search stage, data evaluation stage, data analysis stage, and presentation. This method yielded a robust, unbiased, and comprehensive review of the vaccine provider's impact in gaining patient' acceptance of the HPV vaccine and its initiation.

Section Two: Literature Review

Information Sources and Search Criteria

Whittemore and Knafl's (2005) problem identification stage was utilized in the comprehensive search for supporting literature relevant to the integrative review. This process was used to capture as much literature as possible about increasing HPV vaccination rates among adolescents and young adults. Multiple search strategies and various electronic databases were used to conduct a broad literature search for relevant peer-reviewed articles. This broad search spectrum allowed for minimal bias and a comprehensive rigorous review.

Whittemore and Knafl (2005) have stated that “well defined literature search strategies are critical for enhancing the rigor of any type of review” (p. 548). A comprehensive literature review was conducted to evaluate the strategies that most effectively improve HPV vaccination rates among adolescents and young adults aged 9-26 years; this search was conducted by using three databases: MEDLINE, the Cumulative Index of Nursing and Allied Literature (CINAHL), and PubMed from Liberty University's Jerry Falwell Library. Additionally, a librarian located at the practicum site, Eisenhower Medical Center, was consulted to identify valuable sources and databases to facilitate a more comprehensive literature search, avoid bias, and capture relevant data on HPV vaccinations.

CINAHL was the primary database used for the initial literature search to allow for a comprehensive resource that covered a wide range of health topics, from nursing to multiple allied health disciplines. The initial search focused on the clinical question of: determining if whether or not there is evidence supporting provider strategies to increase patient' acceptance and initiation of the HPV vaccine.

The CDC website was used for current statistical data on HPV infections, vaccination rates, and HPV vaccination guidelines. Multiple keywords and keyword combinations were employed in the search process to identify pertinent and current literature related to the topic. The keywords utilized in the search process included: “human papillomavirus”, “HPV”, “HPV vaccine”, “vaccinations”, “health education”, “HPV knowledge”, “healthcare provider”, “barriers”, and “interventions”. Additional search terms were used to improve the results and included “HPV vaccination”, “provider recommendation”, “education strategies”, “adolescents”, and “HPV-related cancers”. A vast amount of relevant information was found regarding improving HPV infection rates, vaccination rates, and vaccination guidelines among the highlighted demographic.

A preliminary keyword search of the databases identified 578 articles. After exclusion criteria were applied, 85 abstracts were screened, and 37 articles were kept for inclusion in the integrative review. These articles were selected based on the review question that sought to find information on strategies to improve HPV vaccination rates among adolescents and young adults aged 9-26 years.

Quality Appraisal

Identifying the strength and quality of relevant evidence is necessary to decide on healthcare practice changes. According to Whitemore and Knafl (2005), there is “no gold standard for evaluating and interpreting quality in research reviews” (p. 550). Melnyk’s levels of evidence model was used to appraise the literature for quality, content, and evidence strength (Melnyk & Fineout-Overholt, 2015). A single reviewer examined the quality of each study. A variety of levels of evidence existed among the articles included in this integrative review. Using Melnyk and Fineout-Overholt’s (2015) criteria, a literature matrix was developed, focused on the

article citation, level of evidence present, sample or setting for the study, the data collection and interventions, key findings, limitations, and a summary of the findings. The literature chosen included cross-sectional design studies, randomized controlled trials, non-randomized control trials, systematic reviews, and cohort study designs. The remaining articles varied from level of evidence I-VI, including quasi-experimental and randomized control trials. The complete matrix and a comprehensive breakdown of each study are included in Appendix B.

In addition to the level of evidence matrix, the quality of the article guidelines was examined and appraised according to the Appraisal of Guidelines Research and Evaluation II tool (Brouwers et al., 2013). The systematic reviews and other clinical trials were appraised according to the Scottish Intercollegiate Guidelines Network ([SIGN], 2019).

To increase transparency in the article review, Whitemore and Knafl's (2005) method and the preferred reporting items for systematic reviews and meta-analysis (PRISMA) model were utilized to guide the literature search and appraisal process. These models facilitated a structured search process and selection of relevant scholarly literature, aggregate results, and discussion of the main findings. PRISMA is an evidence-based minimum set of items aimed at helping authors to report a wide array of systematic reviews and meta-analyses that assess the benefits and harms of a health care intervention (Moher et al., 2015). PRISMA focuses on how authors can ensure a transparent and complete reporting of this type of research and facilitate a comprehensive literature identification and screening process. The PRISMA flow chart can be found in Appendix A.

Synthesis of Literature

Low HPV vaccinations among young adults were identified as the problem for this integrative review. The purpose of the integrative review was identified along with definite

concepts and variables previously outlined to include both conceptual and operational definitions. Whittemore and Knafl (2005) have emphasized that a well-specified problem and purpose in an integrative review "will facilitate the ability to accurately operationalize variables and thus extract appropriate data from primary sources" (p. 548).

The literature was extensively searched using the electronic databases CINAHL, PubMed's, MEDLINE, and the Cochrane Library with various exploratory combinations of keywords related to HPV vaccination statistics. "Well-defined literature search strategies are critical for enhancing the rigor of any type of review" (Whittemore & Knafl, 2005, p. 548).

In addition to Whittemore and Knafl (2005), each manuscript was assigned a level of evidence using Melnyk's levels of evidence model-based on the study's design, validity, and applicability to the problem statement and purpose of this integrative review (Melnyk & Fineout-Overholt, 2015). The matrix contained the citation, level of evidence, sample or setting for the study, the data collection process and interventions, key findings, limitations, and a summary of the findings. To increase transparency in the review synthesis, the PRISMA framework was utilized to guide the literature search and appraisal process.

The literature review results clearly demonstrated the impact that providers have on patient education, acceptance of the HPV vaccine, and initiation of the HPV vaccine series. In addition, providers and their office staff have a role in patient compliance with the completion of the required number of doses of the vaccine. These important concepts are discussed further in the integrative review section of this report.

Section Three: Results

Themes of Individual Studies

The three themes that emerged from the literature review were HPV vaccine hindrance, educational strategies, and compliance strategies. These themes were consistent throughout the reviewed articles. Providers have had a significant role in dispelling inaccuracies about the HPV vaccine and educating patients on the benefits and low risk of the vaccine. Lastly, providers and their staff have had a responsibility to ensure that patients complete the vaccine series and thus become protected from the harmful effects of HPV.

HPV Vaccination Hindrance

Research studies on HPV vaccination have identified a lack of knowledge about HPV and HPV vaccination as a source of nonadherence. Myths and opinions of HPV vaccination are formed, and young adults cannot fully understand the importance of immunization and the ramifications of not vaccinating. The knowledge of providers, adolescent parents, and young adult's knowledge about the importance of the HPV vaccine is imperative to the success of HPV vaccination campaigns. These campaigns can contribute to increased vaccination rates among adolescents and young adults.

In Piedimonte et al.'s (2018) study, researchers determined that the level of knowledge and awareness of HPV and cervical cancer among university students was a modifiable risk factor to increase HPV vaccinations. The study sought to develop a targeted education and vaccination campaign to increase uptake, hypothesizing that an "HPV education initiative can increase awareness and thus lead to increased vaccination uptake" (p. 441).

Barriers and Attitude. HPV vaccinations have been low despite evidence of the high efficacy of the HPV vaccine. "Since FDA approval of the first HPV vaccine in 2006, overall

coverage of the target age group remains low" (Manhart, 2011, p. 5238). Low vaccination rates suggest that identifying attitudes and barriers towards vaccination and increasing vaccine uptake are necessary. The literature results have identified that barriers such as relationship status, sexual activity, cost, HPV education, parents' versus healthcare providers' recommendation, and vaccine adverse effects were crucial influences of whether or not an individual decided to accept vaccination.

Wilson et al. (2016) assessed attitudinal factors associated with initiation and completion of the HPV vaccination. Main attitudes identified from the study on vaccination uptake included HPV and vaccine knowledge, reproductive health, and future HPV vaccine use. Although the HPV vaccine has been available in the US for over 13 years, only "one-third of adolescents have been fully immunized with all three recommended doses, and only one-third of women ages 9-26 have received one dose of the three-dose series" (Wilson et al., 2016, p. 6). The study identified that cost along with the novelty of the HPV vaccine and being in a monogamous relationship were key barriers to vaccination. Additionally, the study findings confirmed that primary care providers' (PCPs) consistently recommending the HPV vaccine to adolescents and young adults is vital to vaccination. Conclusions identified the need for further discussion of sexual risk assessment and how relationship and sexual activity play a vital role in acquiring HPV and the hesitance towards vaccination.

Public health departments across the US have benefitted from the robust studies on barriers to HPV vaccination initiation and completion. Understanding the barriers and finding ways to combat these barriers and attitudes has been vital to increasing HPV vaccination rates. In a study by Oldach and Katz (2012), researchers identified various barriers that hindered HPV vaccination among male and female adolescents in the Ohio Appalachia area. The participants

identified concerns such as potential vaccine side effects, parental's perceptions that their children were not sexually active, and lack of knowledge about the vaccine. With this study's results, the researchers concluded that, globally, health departments needed to identify future educational tools and interventions to increase HPV vaccinations among this population, focusing on promoting different informational needs for parents of males versus parents of females to make informed decisions about the HPV-vaccine for their children, since the perception of sexual activity and relationships varied among these groups.

Relationship or Sexual Activity Status. Researchers have correlated relationship and sexual engagement statuses as significant barriers to vaccination. Data have identified that relationship and sexual activity status among young adults' impact decisions on whether or not they choose to be vaccinated. Thompson, Vamos, Sappenfield et al. (2016) conducted a study on how relationship status impacts primary reasons for interest in the HPV vaccine among young adult women aged 18-26. They performed a survey-weighted logistic regression analysis and concluded that "married women were more than 40% less likely to be interested in HPV vaccination compared to never-married women and women living with a partner" (Thompson, Vamos, Sappenfield et al., 2016, p. 3122). These results highlight the importance of how relationship status in young adults impacts HPV vaccine interest.

The study conducted by Thompson, Vamos, Sappenfield et al. (2016), participants ages 19-26, believed they did not need the HPV vaccine because they were either married or in a monogamous relationship. The participants acknowledged their belief that being in a monogamous relationship or married lessened their risk for HPV and that they, therefore, did not need to become vaccinated. This belief hindered this population from being appropriately vaccinated against HPV. Robust research exists on acquiring HPV, and the "lifetime risk for

acquiring HPV for a woman with only one sexual partner is 85%” (Thompson, Vamos, Sappenfield et al., 2016, p. 3123). The researchers emphasized the need for additional qualitative research to explore how relationships status impacts HPV vaccination decisions.

Another study conducted by Thompson, Vamos, Vazquez-Otero et al. (2016), highlighted the importance of vaccinating college students due to their increased risk for HPV infection. Additionally, the researchers analyzed how relationship status impacted decision-making regarding the HPV vaccine. The researchers found that among the surveyed college students, HPV vaccination rates increased for all relationship status groups and marital status groups for males and females. They concluded that “higher increases were found among women either living with a partner or married than other relationship status or marital groups” (Thompson, Vamos, Vazquez-Otero et al., 2016, p. 94). This study opened the dialogue for public health efforts that targets college students and explores HPV vaccination programs among them.

Research has shown strong evidence that misconceptions about relationship and sexual status have a significant impact on the initiation and completion of the HPV vaccination series. In a cohort study done by Smith et al. (2015), their research results yielded strong evidence that HPV vaccination did not significantly affect clinical indicators of risky sexual behavior among adolescent females. These findings suggest that “fears of increased risky sexual behavior following HPV vaccination are unwarranted and should not be a barrier to vaccinating at a young age” (Smith et al., 2015, p. E79). Bednarczyk et al. (2012) conducted a retrospective cohort study among adolescent girls aged 11-12 years. They concluded that HPV vaccination at the recommended ages was not associated with increased sexual-activity-related outcomes. During the research for this integrative review, this was the only study to evaluate sexual activity in

relation to HPV vaccination, emphasizing that further research is needed to address this barrier equating increased sexual activity with vaccination.

A study conducted by Cummings et al. (2012) examined the impact of HPV vaccination on subsequent HPV detection and sexual behaviors among urban adolescents in a clinical setting. Women that were selected for the study completed a questionnaire and face-to-face interviews to assess sexual behaviors. Both sexually active and non-sexually active adolescents were sampled. Participants disclosed their sexual behaviors for the one-year period prior to the study, and a face-to-face interview was conducted to assess sexual behaviors within the last two months of the study. The study results demonstrated that HPV vaccination was associated with fewer vaccine-type HPV infections despite incomplete vaccination and high-risk sexual behaviors. This data suggest that the vaccine did not alter sexual behaviors and that the only behavioral difference found was, that recruited women used condoms more frequently.

Vaccine Cost, Safety, and Efficacy. STI, including HPV infections, impose a considerable medical cost on the healthcare system. Chesson et al. (2021) estimated that eight billion dollars would be spent on combating HPV-virus-related health disparities annually. Therefore, prevention and support of vaccine uptake will be vital to combating astronomical treatment costs of HPV-related illnesses in the future. With this estimated cost, vaccination initiatives, provider engagement, and parental support are crucial to decreasing the healthcare cost of HPV-related health disparities through vaccination initiation and completion. The cost of vaccinating to prevent HPV-related disparities is worth the cost of treatment for these disparities.

As with any other vaccinations, the cost can hinder vaccination uptake, particularly when a vaccine is not mandatory. Research studies have identified that the cost of vaccination uptake outweighs the treatment cost of HPV infections that cause cancer in the young adult population.

In a randomized study conducted by Patel et al. (2012), 41.3% of the participants indicated that the most common reason they had for not intending to undergo HPV vaccination was the high out-of-pocket costs or insurance co-payments. Piedimonte et al. (2018) identified students vaccinated during the pilot vaccination campaign; 50% did not complete the three-dose vaccination schedule due to financial reasons and a lack of insurance coverage. To combat this reason for not being vaccinated, many states have developed vaccination programs to assist healthcare facilities and health departments in acquiring the vaccine at low or zero cost to patients.

Pearson et al. (2014) conducted a study using the Burden of Disease Epidemiology, Equity, and Cost-Effectiveness program to find ways to reduce the overall cost per vaccinated individual. The "average cost of the HPV vaccine in the US is \$101-135 per dose and \$61 administration cost per dose" (Pearson et al., 2014, p. 62). This cost-effectiveness analysis compared the cost of two-dose versus three-dose HPV vaccination. Additionally, the researchers discussed key strategies to lowering HPV vaccine costs when healthcare practices buy HPV vaccines in bulk versus doses. The study suggested that government agencies negotiate vaccine prices with suppliers for large-scale public programs to offset the cost of the HPV vaccine. Another critical determinant of the cost-effectiveness is reducing the HPV vaccine to being two instead of three doses if the efficacy of two doses is similar to that of three doses. However, this suggestion would need to be further examined by scientists to test the effectiveness of a two-dose vaccination regardless of a client's age.

Wilson et al. (2016) identified how the Vaccines for Children (VFC) program and Vaccine Patient Assistance programs are valuable to communities worldwide that assist in the no cost or low cost of the HPV vaccine immunization. The VFC program and the Merck Vaccine

Patient Assistance Program help with the cost of vaccinations. The VFC offers the HPV vaccine free or at low cost for girls aged 9-18 years. For women of 19-26 years of age who do not have insurance or have insurance that does not pay for the vaccine, the Merck Vaccine Patient Assistance program can provide the vaccine free of charge or at a low cost (Merck, 2014). Vaccine safety and efficacy should additionally be discussed to improve HPV vaccination rates among the targeted population. Currently, only the Gardasil 9 HPV vaccine is available in the US to prevent HPV and related infections. Gardasil 9 protects against HPV types 6, 11, 16, and 18, the most common HPV types responsible for HPV-associated cancers, including cancers of the cervix, vulva, vagina, penis, anus, and oropharynx. Completing the HPV vaccine series is recommended for both females and males before the first sexual encounter. "Half of all new infections are diagnosed in girls and young women between 15 and 24 years of age, so early vaccination is important" (CDC, 2020).

The HPV vaccine Gardasil, a quadrivalent HPV4 vaccine, has been shown to be nearly 100% protective against strains 6, 11, 16, and 18. This vaccine covers the most high-risk strains of HPV, which can cause cervical cancer and genital warts. The efficiency rate is greater than 99% after a series of three doses with antibody responses greater for females 9 to 15 years as compared with those older than 15 years of age" (Burns et al., 2013, p. 437). Gardasil 9, additionally known as Nonavalent, became available in 2014 to prevent HPV strain types 6, 11, 16, and 18 and five additional oncogenic type strains, strains 31, 33, 45, 52, and 58. The "oncogenic HPV types covered by Gardasil 9 are detected in about 80% of all cervical cancers" (Petrosky et al., 2015). This vaccine is given as a shot intramuscular and requires three doses at zero, two, and six months.

Huh et al. (2017), in a primary analysis of young women aged 16–26 years, showed the efficacy of the Gardasil 9 HPV vaccine against infections and disease related to HPV 31, 33, 45, 52, and 58, as well as non-inferior HPV 6, 11, 16, and 18 antibody responses when compared with Gardasil HPV vaccine against infections and disease related to HPV 6, 11, 16, and 18. The study findings noted that between September 2007 and December 2009, researchers recruited and randomly assigned 14,215 participants to receive the Gardasil 9 ($n = 7,106$). In the per-protocol population, the incidence of high-grade cervical, vulvar, and vaginal disease related to HPV 31, 33, 45, 52, and 58 represented 97.4% efficacy. HPV strains 6, 11, 16, and 18 were non-inferior in the Gardasil 9 vaccine versus the Gardasil vaccine group from month one to three years after vaccination. No clinically meaningful differences in serious adverse events were noted between the study groups. Eleven participants died during the study follow-up period; none of the deaths were considered vaccine-related. Vaccine efficacy was sustained for up to six years. The Gardasil 9 vaccine could provide broader coverage and prevent 90% of cervical cancer cases worldwide (Cheng et al., 2020).

An abundance of research in the literature has indicated that the HPV vaccine is effective, safe, and well-tolerated, with low side effects. No greater adverse events occurred with the HPV vaccines compared to any other vaccine for this age group. In Markowitz et al.'s (2014) report, the authors concluded that there was no difference between the HPV vaccine and its control groups regarding serious adverse events, new onset of chronic diseases, autoimmune disorders, and death. The most common general symptoms included a headache, nausea, and fever. Contraindications included pregnancy and severe allergic reactions after the first dose. Manufacturers suggest that persons with a history of immediate hypersensitivity to yeast should not receive the quadrivalent vaccine (Gardasil and Gardasil 9). Additionally, prefilled syringes of

the bivalent vaccine (Cervarix) are contraindicated for those with anaphylactic latex allergy. It is recommended that providers use the single-dose vials of the bivalent vaccine because it contains no latex (Markowitz et al., 2014).

Parents and Healthcare Provider Recommendations. Current literature has identified that the single most effective predictor for adolescent vaccine uptake is a strong recommendation by the healthcare provider. “Improving healthcare providers’ communication is among the most important strategy for increasing HPV vaccine uptake in the US.” (Gilkey et al., 2015, p. 181). In one study, barriers and attitudes toward HPV vaccination were studied among urban, minority, and economically disadvantaged youth. According to the authors of this article, “our work indicates a profound lack of awareness about HPV vaccination as well as the important influence of parents among urban, economically disadvantaged youth” (Miller et al., 2014, p. 839). According to the CDC (2021), youth below the poverty line have a lower vaccination rate than youth above the poverty line. The study emphasizes the importance of providers educating adolescents and their guardian(s) about HPV and the potential risks regardless of the patient’s socioeconomic status.

Alexander et al. (2015) conducted a 20–30-minute interview among PCPs about their knowledge, attitudes, and practices regarding male HPV vaccinations. Although providers viewed the HPV vaccine as safe and effective, they were uncomfortable discussing vaccination with parents of adolescent males. The provider’s lack of knowledge was the significant factor for their hesitation in promoting the vaccine among this group. While several of the providers believed that both males, and females should be vaccinated, several did not see the importance of male patients receiving the vaccine. Many were not knowledgeable about the HPV vaccine, and their recommendations aligned with the ACIP. This study concluded that there needed to be

“further research on effective interventions to increase physician knowledge about cancer-prevented indications for the HPV vaccination” (Alexander et al., 2015, p. 4086).

Research has shown that healthcare providers’ lack of knowledge and perceived barriers regarding HPV and HPV vaccination account for the variation in vaccine delivery and completion. Rutten et al. (2017) conducted a study that tested the hypothesis that healthcare provider’s knowledge, barriers, and perceived parental barriers regarding the HPV vaccination caused low HPV vaccination rates. This study evaluated clinician knowledge about HPV and HPV vaccination along with barriers that hindered the delivery of the HPV vaccine in a clinical setting. The study’s conclusion supported the hypothesis that greater clinical knowledge is associated with high rates of HPV vaccination initiation and completion, while clinician barriers and perceived parental barriers are associated with lower vaccination rates.

A lack of research exists on how PCPs perceive HPV vaccine guidelines. Perceived HPV guidelines can undoubtedly hinder the initiation and completion of the HPV vaccine series. A provider’s robust knowledge and understanding of the vaccine guidelines are essential to an HPV vaccination campaign. Kulczycki et al. (2016) highlighted the importance of more vigorous efforts to improve HPV vaccination rates among PCPs caring for 11–12-year-old girls in their care. Vaccinations with the HPV vaccine were advised before exposure to HPV, which was more likely during adolescence. PCPs used that age window to promote vaccination to decrease the future cost of HPV-related illness. This study highlighted how it is imperative that PCPs incorporate critical aspects of HPV vaccination guidelines in their care routines. The study found that only “67% of their sample indicated they were likely to prescribe the vaccine to girls might be attributed to the fact that 34% of PCPs reported some ambivalence about the clarity of professional guidelines” (Kulczycki et al., 2016, p. 36). Providers working with this population

must be knowledgeable and adhere to HPV vaccination guidelines. With a lack of clarity of HPV, PCPs may continue not incorporating HPV vaccine practices in their clinics.

A provider's recommendation is significant and necessary for increasing HPV vaccination rates. Mohammed et al. (2016) reported that 72.65% of girls and 51.8% of boys received HPV vaccination recommendations from their PCPs, which varied among several sociodemographic characteristics. This study highlights the importance of PCPs recommending the vaccination at the same rate for girls and boys. The vaccine was recommended to girls 2.57 times more than to boys in this study. With the numerous disparities in provider recommendation of the HPV vaccine, this study highlights the importance of PCPs intervening at the provider level to facilitate increased knowledge and promotion of the HPV vaccine in the adolescent and young adult population. Robust evidence exists that PCP support and recommendations on HPV vaccination are necessary to increase HPV vaccinations in young adults, however, a parent's knowledge about HPV, the vaccine, and related risks is equally important to increase vaccination (Mohammed et al., 2016).

In a study completed by Mullins et al. (2013), "parents were the second most preferred source of information for girls. For parents to provide accurate information, parents themselves need education about the vaccine" (Mullins et al., 2013, p. 4897). As shown by these results, the PCP must educate the guardian in full, which leads to increased vaccination rates. "Effective educational interventions targeting parents may lead to improved vaccine knowledge among girls, as well as increased acceptance of the vaccine among parents" (Mullins et al., 2013, p. 4899). Discussing the vaccine with the adolescent and guardian before the age of 11 can increase awareness of HPV infections and the vaccine and inform the adolescent and guardian of

upcoming preventive anticipatory measures. Educating both parties increases their comfort level with the subject matter and makes discussing HPV infection productive and beneficial.

Study results from Bhatta and Phillips (2015) determined that one out of five parents had discussed the HPV vaccine with their children and their children's PCPs. Additionally, only 19.4% of children and adolescents reported discussing the HPV vaccine with their parents. This low rate was equated to a "general lack of awareness and knowledge about HPV, HPV vaccine, HPV-related diseases, and the risk associated with not vaccinating adolescents" (p. 73). Other reasons included a lack of knowledge about the safety and efficacy of the vaccine, cultural attitudes and beliefs regarding sexual behaviors, and prevention strategies. With this evidence, there is a need to improve and increase community knowledge about the HPV vaccine and the effectiveness of vaccination in preventing HPV-related cancers. Indicated by this study, there need to be more public health education resources available to parents to assist them in discussions on HPV and the HPV vaccine with their children to improve awareness and knowledge about HPV infection and prevention strategies.

Healthcare providers must examine parent's vaccination decision-making processes to identify strategies to increase vaccination uptake during clinic visits. Getrich et al. (2014) conducted a mixed-method study examining HPV vaccine decision-making among female adolescent's mothers utilizing a structured questionnaire and semi-structured interviews. The study concluded that identified factors such as education, socioeconomic status, and health care access among the mothers played a pivotal role in their decision to vaccinate their daughters. Parents' health literacy levels were a key factor in their limited knowledge about HPV and the HPV vaccine. Numerous mothers were uncertain about their daughters' vaccination statuses and perceived a high sense of sexual risk equated with the HPV vaccination; thus they were hesitant

about vaccination. Given this data, PCPs need to “identify and utilize innovative approaches to optimize vaccine use” (Getrich et al., 2014, p. 62). This study highlights how influential the PCPs recommendations are and the importance of identifying specific informational needs about HPV infection and the HPV vaccine, as well as communication strategies for parents to allow for improved decision-making regarding their children’s health. Participants in the study reported that the “reason they did not get the vaccine or subsequent doses was simply that the clinician had not raised the topic” (Getrich et al., 2014, p. 56). Based on the findings from the study, there needs to be further research that contributes to the literature on decision-making processes for parents regarding HPV vaccinations for their children.

Educational Strategies

Although there has been strong evidence-based research on the effectiveness of the HPV vaccine at preventing anogenital cancer, only “70% of adolescent females and 66% of males in the US have initiated the series” (Walker et al., 2019). Educational strategies for clinicians, parents, adolescents, and young adults can be instrumental in improving the strength and consistency of recommendations to increase HPV vaccinations. Piedimonte et al. (2018) have suggested that educational tools such as educational booths, pamphlets, emails, social media infomercials, and face-to-face presentations be used among college students to increase HPV knowledge and facilitate on-site vaccination or appointments through student health centers. During the first phase of the study, where participants were given informative pamphlets, 50% of the 56 participants completed the three-dose regimen. During the second phase, where the researchers extended their platform to social media and emailed infomercial sessions, 64 out of 151 participants initiated their first dose.

Tools such as video presentations and informational pamphlets can be provided to young adults to help assess their intent to vaccinate and increase their knowledge base regarding HPV infection and the vaccination series. These educational tools can present the risks of not being vaccinated, such as developing different types of HPV-associated health disparities like cervical and oropharyngeal cancers. Fu et al. (2014) conducted a systematic review of 33 studies of HPV vaccination educational interventions that hypothesized that “HPV vaccination may be more readily influenced by educational intervention” (p. 1907). A majority of the studies in this systematic review found significant improvement in the attitude and decision-making of adolescents and young adults regardless of the content and format of the educational intervention.

Educational Videos and Presentation Sessions. Vanderpool et al. (2013) conducted a study to test the efficacy of a DVD intervention that promoted HPV vaccine series completion. The researchers compared completion rates of the three dose HPV vaccination series among young women who received the first dose from study personnel at the beginning of the study after reviewing an HPV educational session via a DVD format. In this study, the difference between the intervention and control conditions was either viewing a 13-minute video about HPV or not. Both groups of participant’s received a CDC-produced HPV vaccine fact sheet and a t-shirt. The authors reported that 11% more participants in the intervention versus the control group received all three doses of HPV vaccine within nine months as assessed via medical record review. Furthermore, women who viewed the DVD educational model versus nonviewers were “2.44 more likely to complete the series” (Vanderpool et al., 2013, p. 95). The study results concluded that this type of theory-grounded DVD intervention educational format has a high potential to increase vaccination rates among young women.

Groom et al. (2017) conducted a study to determine if a system-wide assessment and feedback communication tool for healthcare providers would increase HPV vaccination initiation rates in nine primary care facilities within the Kaiser Permanente healthcare system located in Florida. The content of the communication tool was adapted from the CDC-developed presentation, “You Are the Key to Cancer Prevention” (CDC, 2019b). The CDC is aware that HPV vaccination goals are not being met, and robust research has determined that adherence to the full three dose regimen is related to the lack of knowledge and promotion of vaccination by healthcare providers. The CDC website provides access to a vast amount of educational information on HPV for healthcare providers. Healthcare providers include physicians, nurses, nurse practitioners, pharmacists, physician assistants, and medical students, that can use the information found on the website to assist in making effective recommendations and answering parents’ questions.

Within the study conducted by Groom et al. (2017), the researchers developed a two-part informational tool that discussed topics regarding coverage rates for vaccines recommended for adolescents, including HPV initiation and series completion. Communication themes of the informational tool “stressed the importance of making strong recommendations for HPV vaccination, highlighting its role in cancer prevention, explaining the need for the vaccine to be given and including personal statements of support for vaccination” (Groom et al., 2017, p. 590). Additional information included up-to-date information on HPV infections and disease, the HPV vaccine, and ways to communicate successfully with parents about HPV vaccination.

Pamphlets or Brochures. Krawczyk et al. (2012) compared the efficacy of two HPV educational interventions on increasing HPV knowledge and vaccination intentions in college students. Male and female undergraduate participants were recruited from a university in

Montreal, Quebec, Canada. Using theory-based interventions, the participants were randomly assigned to either a written HPV pamphlet, an HPV video, or a control group. HPV knowledge and vaccination intentions were assessed pre-intervention and post-intervention. Low baseline knowledge and intentions were found across groups. Post-intervention, participants in the written and video interventions had significantly higher knowledge and intentions than the control group. No differences were found between written and video interventions on knowledge or intentions. This study comparing HPV educational formats suggests that both written and video interventions are equally effective in educating individuals about HPV and increasing young adults' vaccination intentions. Modern robust technology application options make it possible to provide healthcare providers with various technology options to help young adults decide whether or not to vaccinate against HPV.

Cassidy et al. (2014) conducted a quality improvement project to “determine if an evidence-based educational brochure and reminder system can increase HPV vaccine uptake and dose completion rates” (p. 155). The brochures used in the study were developed based on predictors of parental’s acceptance and the health belief model (HBM) concept, a “theoretical framework concluding that vaccine acceptability was higher when parents believed that the vaccine was effective, when the vaccine was recommended by providers, and when perceived susceptibility to contracting HPV infection was likely” (Cassidy et al., 2014, p. 157). The educational frequently asked questions (FAQ) brochure consisted of FAQ about HPV, FAQ answers, evidence-based discussion, and the HBM construct the educational brochure met. Parents and children were given educational brochures at the time of their clinic visit for preventive care. The results showed that the educational FAQ brochures significantly improved

HPV vaccine and dose completion. Future implications for this evidence-based project signifies the importance of focusing on effective educational and reminder approaches.

Interactive Apps and Active Learning Modules. Working with third-year pediatric residents, Real et al. (2021), conducted a usability evaluation of a novel smartphone application for the HPV vaccination. The researchers sought to report communication strategies to promote effective HPV recommendations among clinicians. “The HPV vaccine: same way, same day smartphone application is a novel health communication intervention allowing clinicians to deliberately practice evidence-based vaccine recommendation strategies” (Real et al., 2021, p. 742). Clinicians interviewed during the study acknowledged feeling ill-prepared to counsel vaccine hesitancy with patients. This interactive web application allowed clinicians to actively learn by engaging in role-playing scenarios featuring an animated parent avatar hesitant about vaccine initiation (Real et al., 2021). The study identified that the interactive app enhanced clinician's skills at administering evidence-based HPV vaccine communication strategies. Additionally, this app offered support for future trials on this type of intervention to improve clinician HPV knowledge. This provides another avenue to allow clinicians to enhance their knowledge and confidence in articulating the benefits of the HPV vaccine among patients.

A substantial amount of research on this type of interactive learning has been used globally in learning institutes to interactively improve adult learning. Learning-based applications focused on increasing the willingness to vaccinate can be instrumental in helping clinicians develop educational and communication strategies to promote vaccination.

“Educational initiatives aimed at current medical students may be an avenue to enhance provider knowledge and thereby improve vaccination rates” (Wiley et al., 2019, p. 357). Researchers at a medical school in Texas conducted a study on team-based learning modules in an undergraduate

medical curriculum to teach medical students about HPV-related cancers and communication strategies to increase willingness to vaccinate. These learning modules can equip medical students with various communication skills that will enhance their knowledge of HPV, thus preparing them to be confident in future medical practices when addressing HPV vaccinations with their clients. The interactive application allowed medical students to watch interactive clinical scenarios between patients and physicians that involved HPV vaccination. The medical students were able to participate in the interactive models to identify weaknesses in their knowledge of HPV and then hone in on those weaknesses by participating in detailed topics on HPV to more comprehensively understand the topics. Based on the study's results, there seems to be promising data to support the use of active learning modules as an education strategy to improve providers' knowledge of HPV and confidence to discuss its relevance once they practice medicine.

Patel et al. (2012) explain that "research should find ways to implement HPV interventions via technologies acceptable among medical college students, to include text messaging, e-mail, and social networking application, as it could improve the efficacy of intervention" (p. 151). In a study conducted by Johnson-Mallard et al. (2019), the researchers, hypothesized the feasibility of technology increasing informed decision-making among medical students through the use of smartphones, and mobile health tracking apps. Evidence was explored to support strategies to facilitate digital health technologies aimed at increasing risk perception of the HPV virus and awareness of the HPV vaccine. The researchers developed a 54-item electronic questionnaire that explored "digital health technologies in addition to HPV knowledge, individual risk perception, and awareness of the HPV vaccine" (Johnson-Mallard et al., 2019, p. 87). The support for digital technology platforms to disseminate evidence-based

HPV data and HPV vaccination educational information among medical academics and other settings can improve health care providers' confidence in discussing topics related to HPV and HPV vaccines, thus improving healthcare recommendations to vaccinate.

Compliance Strategies

The availability and supply of the HPV vaccine are abundant for adolescents due to the VFC program, which assures universal vaccination coverage for minors. However, it has been reported that difficulties in successful vaccine implementation beyond the first dose are due to a lack of functional tracking systems and reminder capabilities (Getrich et al., 2014). Additionally, current literature has indicated an “increase in the use of text messaging and interactive apps as mobile health interventions, with evidence that these methods have succeeded in reducing missed appointments, educating adolescents about sexual health, and tracking patient information” (Johnson-Mallard et al., 2019, p. 85). Community Preventive Services Task Force, an entity of the CDC, has endorsed an evidence-based strategy to increase vaccination rates by sending various types of reminder messages to alert clients of vaccine recommendations as part of their vaccination compliance initiative (Community Preventive Services Task Force, 2015).

Electronic Health Record Reminders. Various research studies have supported the use of clinical reminders within a patient's electronic health record (EHR). Bae et al. (2017) reported promising data that physicians who use clinical reminders are more likely to order HPV immunizations for their patients. Furthermore, given that HPV incidence significantly decreases, with small increases in vaccination rates, clinical reminders serve as an instrumental compliance strategy to increase HPV vaccination. “EHRs have the ability to provide clinical reminders that support evidence-based care; as such, there is an expectation that such systems will improve care processes and outcomes” (Bae et al., 2017, p. 353). Clinical research in vaccination uptake has

shown that using EHRs as a clinical support tool improves preventive care services, such as vaccinations, preventive medication prescriptions, screening, and preventive measures in the healthcare setting. EHRs have the capability to employ clinical reminders that may facilitate an increase in HPV vaccination rates. Conclusions from the study by Bae et al. (2017) identified that “clinical reminders from EHRs are positively correlated with better care processes related to HPV vaccination” (p. 56). Their data results identified that this was more prevalent in the male population. Given that males have a higher prevalence of HPV infections, the data results are essential in incorporating clinical reminders within EHRs to increase vaccination uptake.

Postcard Reminders. The CDC Community Guide currently sends reminder messages to alert parents of vaccines recommended for their children. This postcard reminder strategy targeting immunization, including HPV vaccine initiation, has shown a moderate increase in vaccination uptake. Various research studies have supported the effectiveness of postcard reminders, and, if used, other compliance strategies, in boosting vaccination uptake. Staras et al. (2020) showed that postcard reminders increased HPV vaccine initiation of at least one dose by 60% for girls. The study assessed “the percentage increase in HPV vaccine initiation from reminders increasing preventive care visits or increasing the likelihood of vaccine receipt during preventive care” (Staras et al., 2020 p. 1). Guided by a health belief model, researchers developed a postcard reminder intervention, “86% of parents in the Medicaid and CHIP enrollees reported preferring to receive health information about their child by mail” (Staras et al., 2020, p. 3). The results from the study identified that postcards reminders along with providers’ recommendations at clinic visits increased HPV vaccinations by 44%. Only 8.9% of vaccination were attributed solely to postcard reminders. Future implications for this data suggest that

“decreasing the time between vaccine reminders and preventive care appointments may maximize the priming effect of reminders” (Staras et al., 2020, p. 6).

Phone or Email and Text Message Reminders. Technology improvements have facilitated many adolescents and young adults having unlimited text message capability through their phone services. With the on-the-go mentality among these two populations, they prefer the text message option to communicate vaccine reminders (Hofstetter et al., 2017). This communication method has been effective in scheduling appointments and providing reminder of appointments for vaccine initiation and completion. Hofstetter et al. (2017) conducted a study that showed how text-message reminders, particularly those with embedded educational information, benefitted general pediatric vaccination. This was a randomized clinical trial that compared the effect of plain text versus educational text message reminders on receipt of the HPV vaccination among four pediatric primary care clinics. Clients that were “sent plain rather than educational text message reminders were more likely to receive the needed vaccine by 4weeks, but not 12 or 24weeks, after the initial message” (Hofstetter et al., 2017, p. 4554). The results concluded that plain or educational text messages were beneficial in increasing HPV vaccination rates. However, plain text messages reminders due to their simple and direct message, were likely to be more beneficial in the short-term than the long-term.

Additional studies by Rand et al. (2017) and Reiter et al. (2012) have provided additional support for email, EHR, phone, and text message reminders as crucial for increasing HPV vaccination rates. Both studies identified that generated text messages reminders were beneficial for clients with valid phone numbers and the capability to receive text messages. Current studies in the literature have suggested that if the compliance strategies discussed are combined with other complementary interventions, there is potential to increase HPV vaccination among the

population identified. This is an effective strategy healthcare providers can use to promote HPV vaccination among the adolescent and young adult populations (Francis et al., 2017).

Additionally, the CDC has a wealth of educational videos, tutorials, and informational tools available to providers on the CDC website that can be utilized for one to become educated on HPV, the HPV vaccine, and preventive measures. Since providers' recommendations are pivotal to vaccination initiation and completion, the CDC has developed five ways to boost HPV vaccination rates for healthcare providers.

Implementing these practical and proven strategies within a provider's healthcare setting is necessary to increase vaccine uptake. Firstly, they recommend bundling required adolescent vaccines in the same way on the same day to include the HPV vaccine. Secondly, providers need to ensure their staff receive the same training on how to successfully communicate with clients about HPV and the vaccine. Thirdly, providers should use all opportunities to vaccinate by establishing clinic policies that check immunization at each visit, recommend vaccination at all times, and establish automatic call reminders. Fourthly, providing personal examples of how providers support the HPV vaccine for their family members will make the client more comfortable in receiving vaccinations. Lastly, providers and their staff should learn how to accurately answer vaccination questions using language clients can fully understand.

Synthesis of Results

Toronto and Remington (2020) emphasize that data analysis of an integrative review "requires the reviewer to order, code, and categorize data from multiple sources that may have used diverse methodological perspectives" (p. 60). This integrative review section of the data analysis reveals a comprehensive interpretation of the data extracted from the research articles, appraised for relevancy. A thorough and unbiased understanding of research articles and an

innovative synthesis of the evidence were used to summarize the research articles to support the integrative review purpose (Whittemore & Knafl, 2005). Further in-depth data analysis, including data reduction, data display, data comparison, and conclusion drawing and verification, were utilized in the literature review.

The primary focus of this integrative review was education promotion among healthcare providers to increase HPV knowledge, initiate the HPV vaccine, and ensure completion of the vaccine series. Having completed a detailed examination of the literature, the project leader found significant evidence to support three broad themes. The themes are HPV vaccination hindrance, HPV educational strategies, and HPV vaccine compliance strategies for completion of the vaccine series.

The research articles examined during the integrative review recognized the lack of HPV knowledge among providers and staff, parents, and patients. This lack of knowledge among all persons created barriers and negative attitudes, which hampered vaccination uptake among adolescents and young adults. Parents were particularly concerned about HPV vaccine uptake and sexual activity in their adolescents. Individuals who were not sexually active or in an exclusively monogamous sexual relationship were less likely to feel the need to initiate HPV vaccination. Vaccine cost was an issue in many earlier studies, but with time, there have been many programs to make the vaccine free or at minimal cost to patients. Literature supporting educational strategies and vaccine safety has concluded that the HPV vaccines are effective, safe, and strongly recommended starting at age 9 up to 26. When healthcare providers recommended the vaccine, patients and their parents were more likely to initiate the vaccine series.

Conducting an up-to-date literature review identified methods to educate adolescents and young adults about HPV infection and strategies to improve HPV vaccination rates. The

literature review distinguished educational issues from personal preferences and characterized evidence in a helpful and recognizable manner to further influence adolescents and young adult's knowledge and outcomes with HPV prevention. Examples of effective educational strategies include video, pamphlets, brochures, and interactive apps.

Throughout the literature review, many compliance strategies were offered as ways to increase the completion of the vaccine series, whether it was the two-dose or the three-dose series. Examples of the strategies offered were postcard reminders, phone messages, email, and text messages. Many of these strategies were used in combination with another strategy to increase the effectiveness of compliance.

The three themes discussed of HPV vaccination hindrance, educational strategies, and compliance strategies for completing the vaccine series have been comprehensively covered in the literature and are completely effective if utilized by providers and their staff. Unfortunately, despite the efforts by the CDC and researchers to study and produce educational materials and compliance strategies that work, the overall rates of HPV vaccination remain relatively low in comparison to other childhood and young adult vaccines.

Ethical Considerations

Identifying strategies to improve HPV education among young adults did not raise any ethical concerns. An application was submitted to the Liberty University Institutional Review Board. It was found to be in accordance with the Office for Human Research Protections and Food and Drug Administration regulations and not classed as human subjects research (See Appendix C). Mandatory training was completed through the Collaborative Institutional Training Institution on basic biosafety; a completion certificate was provided (See Appendix D).

Timeline

1. Pre-Proposal approval submit in Fall of 2017 to DNP Proposal Committee for approval
2. Scholarly Project Chair assigned Fall of 2017
3. Project Site Letter of Support and Preceptor Summer 2018
4. Phase 1 components completion in Fall 2018
 - a. Project proposal section 1 and 2 submitted in NURS 840
 - b. Project proposal section 1-3 submitted one week after NURS 840
 - c. Decision of final project proposal given
 - d. Project Proposal defense PowerPoint submitted
 - e. Due to military deployment, obligations, and COVID, the project leader took a absence from the DNP program in December 2018 and returned Fall 2020 D Term.
5. Phase 2 components completion in Fall 2020
 - a. Changed scholarly project into an Integrative Review and developed new clinical questions.
 - b. Completed an updated integrative search of articles that addressed the impact of the healthcare provider's role in gaining patient acceptance of the HPV vaccine.
6. Phase 3 components completion in Spring 2021 (NURS 842)
7. Phase 4 components completion in Spring 2021 (NURS 843)
 - a. Integrative Review sections 1-2 completed
 - b. First defense completed

- c. Submitted IRB application for approval
8. Final Phase Summer 2021 (NURS 844)
- a. IRB approval
 - b. Integrative Review sections 3-5 completed
 - c. Edited final Integrative Review sections 1-5
 - d. Final Defense
 - e. Submit final Integrative Review manuscript
 - f. Send Integrative Review to Scholar's Crossing

Section Four: Discussion

The purpose of the integrative review was to examine the impact of the provider on gaining the patient's acceptance of the HPV vaccine and the subsequent initiation of the vaccine series. The expected outcome of the integrative review was to identify evidence-based strategies in the literature that providers could use to gain patient's acceptance of the HPV vaccine and its subsequent initiation as well as to provide recommendations to providers for future practice among adolescents and young adults. The three themes that emerged from the literature review were HPV vaccine hindrance, educational strategies, and compliance strategies. These themes were consistent throughout the reviewed articles.

Barriers and attitudes, vaccine safety and cost, relationship and sexual activity status, and parent versus provider recommendation were cited as reasons behind a hesitancy to vaccinate. Questions about HPV vaccine safety and durability of protection was common hindrances to vaccinating. HPV vaccinations have remained low compared to other adolescent vaccinations. However, there has been a vast amount of evidence-based research that supports the high efficacy and safety profile of the HPV vaccine. Increasing HPV vaccination rates has been one of

the most profound opportunities for cancer prevention. Current research supports the efficacy and safety of the HPV vaccine and its significant role in combating HPV infections that may lead to cancer.

Scientific experts have carefully studied the HPV vaccine, and its safety is continually monitored. This is not a new vaccine, and, for years, the HPV vaccine, has been shown to be effective and safe. The HPV vaccine has a similar safety profile to the meningococcal and Tdap (Tetanus, Diphtheria, Pertussis) vaccines. Like other vaccine shots, side effects can happen, but most are mild, primarily produce pain or redness in the arm, and have not been associated with any long-term side effects.

Since 2006, about 57 million doses of HPV vaccine have been distributed in the US, and in the years of HPV vaccine safety studies and monitoring, no serious safety concerns have been identified (Cummings et al., 2012). There is no data to suggest that receiving the HPV vaccine has an effect on future fertility. However, HPV infection can cause cervical cancer, and the treatment of cervical cancer can leave women unable to have children. Thus, vaccination against HPV infection is necessary to combat this type of cancer in women.

More research is needed to enhance the understanding of the HPV vaccine and how to implement vaccination campaign changes in healthcare organizations to make this kind of vaccine mandatory, similar to the measles, mumps, and rubella vaccine. The CDC has used data collected from the National Health and Nutrition Examination Survey to determine the prevalence of HPV infection before and after HPV vaccine introduction. HPV prevalence declined by half after vaccine introduction in 14-19-year-olds. The study showed that the vaccine was effective when the vaccination series was complete (Cummings et al., 2012).

The cost of the HPV vaccination was identified as a hindrance to vaccine uptake. The completion of the HPV vaccine series can cost upward of \$490 (Pearson et al., 2014). Although insurance plans fully cover the cost of routinely recommended vaccinations through the American Care Act, clients can have to pay out-of-pocket. This cost can hinder vaccination; however, providers must identify adolescent clients that may have out-of-pocket costs and connect them with the federal VCF program to cover the full cost of the vaccines. Ultimately, the cost of treatment for complications of HPV would most likely be greater than the initial cost of vaccinating individuals to ensure that they do not acquire HPV (Pearson et al., 2014).

The annual estimated cost of HPV-associated diseases in the US is eight billion dollars, including 6.6 billion due to routine screening. With new technologies, it is hoped that there can be more efficient screening, augmented by more organized screening systems, and vaccination leading to reduced screening costs. Estimates of the direct medical costs attributable to HPV infection can help quantify the economic burden of HPV complications and illustrate the economic benefits of HPV vaccination.

A National Immunization Survey conducted by Stokely et al. (2015) cited that hesitancy of vaccination uptake by parents was due to a lack of knowledge about HPV infections and the vaccine. The association of the HPV vaccine with sexual activity contributes to the hesitancy due to parents fearing that the vaccination condones sexual activity. However, during the integrative review, there was no evidence to suggest that receiving the vaccine led to sexual relationships. Parents may be concerned that allowing their children to receive the HPV vaccine will be seen by children as permission to have sex. However, multiple studies have determined that girls who receive the HPV vaccine do not engage in sexual intercourse sooner than their peers who do not

receive the HPV vaccine. These studies have further shown that receiving the HPV vaccine does not lead to children being more likely to start having sex at a younger age (Stokely et al., 2014).

A vast amount of research studies have identified that the key to increasing HPV vaccination rates is recommendations from healthcare providers. Healthcare providers need to develop communication strategies to increase knowledge regarding cancer prevention benefits, efficacy, and safety of HPV vaccines to facilitate understanding in clients. These providers can additionally implement clinic policies that can influence vaccinations. The National Foundation for Infectious Diseases (2014) has published a call-to-action report for U.S healthcare providers that has addressed key strategies providers can take to increase HPV vaccinations, thus reducing the burden of HPV-related cancers. Healthcare providers should, 1) recommend the HPV vaccine with the same strengths and conviction used to recommend other adolescent vaccines, 2) educate themselves about HPV infections and HPV vaccines, 3) inform their colleagues to ensure that all staff throughout the practice deliver the same HPV messages, 4) communicate vaccination benefits to parents and adolescents at each opportunity, 5) make vaccination procedures routine and focus on ways to reduce missed opportunities (NFID, 2014, p. 2).

After reviewing the literature, to improve HPV vaccination rates, there needs to be educational strategies incorporated within healthcare practices to educate healthcare providers, adolescents, young adults, and their parents and guardians about the importance of HPV vaccinations. When healthcare providers are adequately informed about HPV, the benefits, safety, and efficacy of the vaccine, vaccination rates will increase worldwide. Following a practice model that incorporates HPV education will facilitate adolescents and young adults making informed decisions about the uptake of the vaccine. Education strategies such as educational video presentations, education pamphlets and brochures, and interactive apps are key

educational strategies that can facilitate understanding HPV infections and the positive effect of the HPV vaccine.

There is a vast amount of research evidence that supports various compliance strategies to increase HPV vaccination rates. Compliance strategies, as multiple studies have emphasized, are vital for supporting healthcare vaccination reminder systems. Tools such as postcard messages, EHR reminders, automated phone calls, and email and text message reminders play an integral role in increasing immunization adherence to support HPV disease prevention. These compliance strategies are effective at increasing rates of HPV vaccine completion by reaching patients who initiate the HPV vaccine series. The use of these compliance strategies and other key vaccination strategies are positively correlated with improved care processes related to HPV vaccination. Each of these compliance strategies has seen success during targeted vaccination initiatives (NFID, 2014). Promoting these strategies and making HPV vaccination a priority for adolescent and young adult healthcare will help protect this age demographic throughout their lives.

Implications for Practice

The ACIP recommends HPV vaccination for young adult females and males to prevent HPV-related cancers and genital warts. As this prevention mechanism continues to be disseminated, it is necessary to monitor the uptake of this vaccine. Young adults represent an essential population for HPV vaccination efforts and surveillance due to their increased risk for HPV infection and this demographic representing a priority population for follow-up HPV vaccination.

Survey data from 2013 was used to assess the association of demographic variables with HPV vaccine uptake among college females and males. Thompson, Vamos, Vazquez-Otero et al.

(2016) followed college females and males (aged 18-21 years) for four years concerning vaccination rates. A significantly higher proportion of females received at least one dose of the HPV vaccine than males (59.0% females, 29.8% males; p -value < .010). Rates of HPV vaccination for females were more than double the rates for males between Fall 2009 and 2011. While female rates continued to surpass male vaccination rates in 2012 and 2013, both groups experienced increases in HPV vaccination rates from 2009 to 2013.

Increases in HPV vaccination rates over the five years were evident for all demographic subgroups. The most significant difference in vaccination rates for females was for women in the 22-26 age category. For both genders, younger age was associated with HPV vaccination. For females, aged 18-21 years were 1.49 times more likely to be vaccinated than 22 to 26-years old females. This effect was more pronounced for males, with 18 to 21-year-old males being 2.26 times more likely to be vaccinated than 22 to 26-year-old males (Thompson, Vamos, Vazquez-Otero et al., 2016).

Continued research in HPV vaccination for adolescents and young adults is needed to develop evidence-based guidelines to ensure proper vaccination coverage. Continuous educational awareness about the HPV vaccine, its safety, efficacy, and long-term health impact being provided to the provider, the adolescent, and the adolescent's guardian is imperative. This is essential to increasing and sustaining HPV vaccination rates and allowing for long-lasting and effective vaccination coverage for adolescents and young adults. "HPV vaccination rates among adolescents did not meet the Healthy People 2020 goal of 80% coverage" (Gilkey et al., 2015, p. 181). Missing this goal places adolescents and young adults at risk for HPV health disparities such as cancer.

The literature has suggested that the healthcare provider's recommendation for vaccination is key to endorsement and acceptance. "Improving healthcare providers' communication is among the most important strategy for increasing HPV vaccine uptake in the US" (Gilkey et al., 2015, p. 181). Therefore, it is crucial that providers seek to improve their counseling encounters and strategies with adolescents and parents to integrate these vaccines into practice. When providers start to assess, educate, and plan at each opportunity during an adolescent's visit, vaccination rates should improve. Predictive factors of HPV vaccine uptake are a "strong physician recommendation, being a student, and perceiving the importance of the HPV vaccine" (Thompson, Vamos, Vazquez-Otero et al., 2016, p.97).

Limitations

A limitation of this integrative review was that the article search was restricted to English-language publications. Therefore, the results are difficult to generalize beyond Western European, Australian, and North American populations. Furthermore, a majority of the reviewed studies comparing vaccine hindrance, educational strategies, and communication strategies in promoting HPV vaccination were conducted in the US. Given that social norms and beliefs differ by culture, care must be exercised when extrapolating the findings of this review to other populations.

Dissemination

Contributing to ongoing evidence on strategies to improve HPV vaccination uptake, this manuscript will be disseminated through a nursing journal to facilitate HPV vaccination education among healthcare providers. Enhancing healthcare providers' knowledge of the HPV vaccine promotes HPV vaccination among adolescents and young adults. The author will promote this topic to support the HPV vaccination initiative and awareness of HPV infection

while positively impacting the educational strategies for preventing this virus. The integrative review will be published and made available for viewing through the Liberty University Library Scholars Crossing.

Summary

In conclusion, extensive research for this integrative review identified that the US lags in HPV vaccine coverage compared with other countries. A vast amount of evidence-based research on HPV prevalence has supported the efficacy of the vaccine in reducing HPV-related cancers. Completion of HPV vaccinations is an effective cancer prevention strategy. A lack of HPV vaccination leads to adolescents and young adults being exposed to potential HPV cancers. Properly vaccinating adolescents and young adults has the potential to prevent unnecessary suffering and death related to HPV infection. The research studies in this integrative review have supported that the HPV vaccine has great potential to prevent cervical and other anogenital cancers. Vaccine uptake research suggests educational programs assist in increasing HPV vaccination rates; thus, healthcare providers must promote and educate adolescents and young adults on the ACIP HPV vaccination recommendation, using the vaccine as primary prevention of HPV infections. In addition, this will assist in decreasing the astronomical healthcare cost of treating HPV infections in the future.

Current HPV vaccine coverage is currently below what is required to see effects on HPV-related morbidity and mortality. Research on improving HPV vaccine coverage will continue to remain at the forefront of improving HPV vaccine uptake and completion. This integrative review highlighted the importance of HPV education among parents and PCPs to increase knowledge about HPV infection, thus promoting vaccine uptake and preventing HPV-related cancers. Key points of the integrative review include, that HPV vaccines are the most effective

and safest way to protect against HPV infection. Education on the benefits of HPV vaccination is key to increasing vaccination rates, and providers' confidence in the vaccine benefits motivates HPV vaccination among the studied population.

Key steps to improving HPV vaccination rates hinges on making HPV vaccination a public health priority. Healthcare providers can lobby for adequate reimbursement for HPV vaccines, improved administration, and removing barriers to paying for HPV vaccines. Currently, HPV vaccination is not a part of the Healthcare Effectiveness Data and Information Set (HEDIS), a set of widely used performance measures to manage care. Expansion of HEDIS measures regarding HPV vaccination to include adolescent males and young adults could be beneficial for increasing vaccinations among these groups. Developing a centralized immunization information system that is interoperable can promote and facilitate HPV vaccination.

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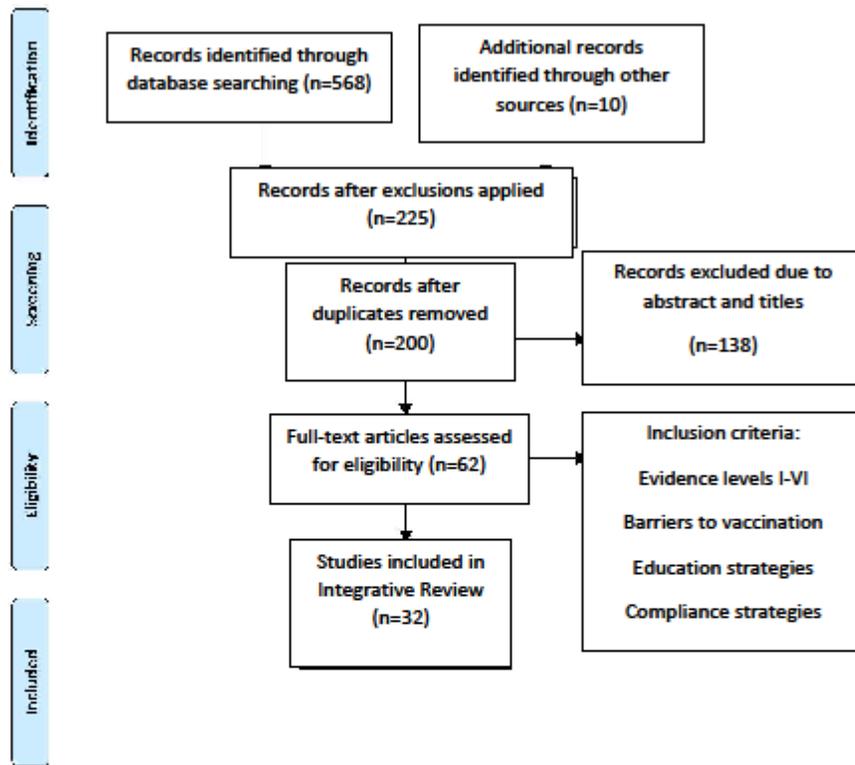
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Appendix A: PRISMA Flow Chart



Appendix B: Level of Evidence Table

Article	Author	Study Purpose	Sample	Methods	Study Limitations	Study Results	LOE	Use as Evidence to Support a Change?
1	Alexander, A. B., Best, C., Stupiansky, N., & Zimet, G. D. (2015). A model of health care provider decision making about HPV vaccination in adolescent males. <i>Vaccine</i> , 33(33), 4081-4086. https://doi.org/10.1016/j.vaccine.2015.06.085	Identify health care provider (HCP) knowledge, attitudes, and behaviors regarding adolescent male HPV vaccination, one year, after routine vaccination of adolescent males was recommended.	20 providers, mostly female (n=15) and white (n=15), practicing pediatric from one to 35 years	Qualitative Design Semi-structured Interviews	The sample size limited the generalizability of the findings, which may not be applicable to different groups of HCPs. Additionally; sites were with high adolescent vaccination rates and a high proportion of patients on state-funded insurance programs.	Providers did not routinely recommend HPV vaccine due to lack of knowledge, lack of trust in vaccine effectiveness, discomfort in discussing sexual orientation and STDs with adolescents. HCP had a positive opinion about HPV vaccine and offered it to most of their male patients	Level III.	Yes, the results from this study may help to inform the development and evaluation of interventions for physicians to increase vaccine uptake and may inform future, larger scale, research in diverse settings to gain a better understanding of physician knowledge, attitudes, and practice around HPV vaccination.
2	Bae, J., Ford, E. W., Wu, S., &	To explore the relationships among	The study analyzed 3	Cross-sectional	The sample size was not	Analyses indicated that	Level III	Yes, using clinical reminders is strongly

	Huerta, T. (2017). Electronic reminder's role in promoting human papillomavirus vaccine use. <i>The American Journal of Managed Care</i> , 23(11), e353-e359. https://pubmed.ncbi.nlm.nih.gov/29182355/	HER adoption, clinical reminder use, and HPV immunization rates.	adolescent visit samples during 2007-2012. And 3 visits with female patients aged 11 to 26 years and male patients aged 11 to 21 years. Total: (25,573 visits).		even distributed.	compared with physicians without clinical reminder functions, physicians with clinical reminder functions were more likely to order HPV vaccines. Clinical reminder functions were particularly effective at increasing HPV vaccine use among adolescent males.		associated with higher vaccination rates for human papillomavirus (HPV).
3	Bednarczyk, R. A., Davis, R., Ault, K., Orenstein, W., & Omer, S. B. (2012). Sexual activity-related outcomes after human papillomavirus vaccination of 11- to 12-year-olds. <i>Pediatrics</i> , 130(5), 798-805.	This study evaluated sexual activity-related clinical outcomes after adolescent vaccination.	Study included 1398 girls (493 HPV vaccine-exposed; 905 HPV vaccine-unexposed).	Retrospective Cohort Study	Limitations included: conducted by using a retrospective analysis of administrative data. The use of this type of data precludes an assessment of motivations for care. Population	Risk of the composite outcome (any pregnancy/sexually transmitted infection testing or diagnosis or contraceptive counseling) was not significantly elevated in HPV vaccine-exposed girls relative to HPV vaccine-	Level II	HPV vaccination in the recommended ages was not associated with increased sexual activity-related outcome rates.

	https://doi.org/10.1542/peds.2012-1516				was restricted in terms of age at vaccine uptake, which may limit our ability to generalize outside of this age range.	unexposed girls (adjusted incidence rate ratio: 1.29, 95% confidence interval [CI]: 0.92 to 1.80		
4	Bhatta, M. P., & Phillips, L. (2015). Human papillomavirus vaccine awareness, uptake, and parental and health care provider communication among 11- to 18-year-old adolescents in a rural Appalachian Ohio county in the United States. <i>The Journal of Rural Health</i> , 31(1), 67-75. https://doi.org/10.1111/jrh.12079	Examined HPV vaccine awareness and uptake, and communication with a parent/healthcare provider	1299 participants, grades 6-12. 51.9% were male and 90.3% were white in rural Appalachian Ohio county.	Cross sectional survey	Limitation includes being conducted in only one county in Appalachian Ohio; thus, the generalizability to a wider region may be limited. study also did not include a question on intention to get vaccinated, which could have provided an additional layer of information,	Despite the strong link between parental and health care provider communication and HPV vaccine uptake., the levels of communication remain low in this population.	Level III	Yes, these findings suggest that need for public health education programs targeting the health care providers, the parents, and the adolescents to improve awareness, knowledge, and HPV vaccine uptake.

5	Cassidy, B., Braxter, B., Charron-Prochownik, D., & Schlenk, E. A. (2014). A quality improvement initiative to increase HPV vaccine rates using an educational and reminder strategy with parents of preteen girls. <i>Journal of Pediatric Health Care</i> , 28(2), 155-164. https://doi.org/10.1016/j.pedhc.2013.01.002	To determine if an evidence-based educational brochure and reminder system can increase HPV vaccine uptake.	24 parents of preteen girls from a private pediatric practice (cohort) and a historical control group of 29 parents	Quasi-experimental retrospective design	Using the quasi-experimental design did not allow the researcher to say with confidence that the intervention caused the increase in HPV vaccine uptake and dose completion	HPV vaccine uptake rate was 75% in the cohort and 24.1% in control group. Parents who received the clinical protocol had a significantly greater HPV vaccine uptake rate than the parents in the control group. Completion rates were 62.5% in the cohort and 6.9% in control group.	Level II	Yes, The evidence-based educational and reminder strategy for parents of this preteen age group significantly improved HPV vaccine uptake and dose completion.
6	Cheng, L., Wang, Y., & Du, J. (2020). Human papillomavirus vaccines: An updated review. <i>Vaccines</i> , 8(3), 391. https://doi.org/10.3390/v8030391	Researchers present the updated information about current HPV vaccines, focusing on vaccine coverage and efficacy	N/A	Survey Review	N/A	HPV vaccines significantly decreased HPV infection and HPV related diseases. With the improvement in vaccine coverage and the introduction of	Level V	More efforts should be put into increasing the vaccine's coverage, especially in low- and middle-income countries. Provision of education on HPV and vaccination is one of the most important

	3390/vaccines8030391					pan-gender vaccination programs, better protection against HPV infections and fewer HPV-related cancer cases are expected. T		methods to achieve this.
7	Chesson, H. W., Spicknall, I. H., Bingham, A., Brisson, M., Eppink, S. T., Farnham, P. G., Kreisel, K. M., Kumar, S., Laprise, J., Peterman, T. A., Roberts, H., & Gift, T. L. (2021). The estimated direct lifetime medical costs of sexually transmitted infections acquired in the United States in 2018. <i>Sexually Transmitted Diseases</i> , 48(4), 215-221.	Estimating the lifetime medical costs attributable to sexually transmitted infections (STIs) acquired in 2018, including sexually acquired human immunodeficiency virus (HIV).	NA	Quantitative Study	Scarcity of data to inform the model parameters. ¹⁹ ,20,43–46. Given data limitations, they did not apply age-specific lifetime cost estimates.	Incident STIs in 2018 imposed an estimated \$15.9 billion (25th–75th percentile: \$14.9–16.9 billion) in discounted, lifetime direct medical costs (2019 US dollars). Most of this cost was due to sexually acquired HIV (\$13.7 billion) and HPV (\$0.8 billion). STIs among 15- to 24-year-olds accounted for \$4.2 billion (26%) of the cost of incident STIs.	Level III	Incident STIs continue to impose a considerable lifetime medical cost burden in the United States. These results can inform health economic analyses to promote the use of cost-effective STI prevention interventions to reduce this burden.

	https://doi.org/10.1097/OLQ.0000000000001380							
8	<p>Cummings, T., Zimet, G. D., Brown, D., Tu, W., Yang, Z., Fortenberry, J. D., & Shew, M. L. (2012). Reduction of HPV infections through vaccination among at-risk urban adolescents. <i>Vaccine</i>, 30(37), 5496-5499.</p> <p>https://doi.org/10.1016/j.vaccine.2012.06.057</p>	Examined the impact of HPV vaccination on HPV acquisition in a clinical setting	75 women recruited into the PC were matched with 2 women selected from the 387 YWP participants	Cohort Study	Temporal separation of the two cohorts (almost 10 years) and thus we cannot totally exclude the possibility that some other external factor is not measured may have contributed to the findings of reduced HPV detection of the quadrivalent HPV types or the observations in sexual behaviors.	Study demonstrates that vaccination of adolescent females was associated with fewer vaccine-type HPV infections, suggesting that the quadrivalent vaccine was very effective, even in the context of high risk behaviors and variable HPV vaccine completion. As expected the impact of vaccination was strongest for those with two or more doses of the vaccine	Level III	Support the need for early and catch-up vaccination in all adolescent and young adult women and serves to remind clinicians and parents that vaccination should be targeted for all at 11-12 years of age to maximize its impact rather than waiting until the adolescent is older. In addition, we found evidence that the vaccine did not increase sexual risk behaviors. This evidence, however, is somewhat limited and larger prospective studies may help further to understand whether, and in what way, HPV vaccination influences sexual behaviors.

9	Francis, D. B., Cates, J. R., Wagner, K. P. G., Zola, T., Fitter, J. E., & Coyne-Beasley, T. (2017). Communication technologies to improve HPV vaccination initiation and completion: A systematic review. <i>Patient Education and Counseling</i> , 100(7), 1280-1286. https://doi.org/10.1016/j.pec.2017.02.004	Systematic review that examines the effectiveness of communication technology interventions on HPV vaccination initiation and completion.	Twelve relevant studies were identified with a total of 38,945 participants.	Systematic Randomized Review	Studies had to be published in order to be included; thus, it is possible that studies with less impressive results were excluded. Could not assess the effectiveness of technology-based interventions relative to human-delivered interventions.	The interventions were delivered using several different methods, including EHR (i.e. recall/reminder) prompts, text messaging, automated phone calls, interactive computer videos, and email. Vaccine initiation and completion was greater for technology-based studies relative to their control conditions.	Level V	There is evidence that interventions utilizing communication technologies as their sole or primary mode for HPV vaccination intervention delivery may increase vaccination coverage. Communication technologies hold much promise for the future of HPV vaccination efforts, especially initiatives in practice-based settings.
10	Fu, L. Y., Bonhomme, L., Cooper, S. C., Joseph, J. G., & Zimet, G. D. (2014). Educational interventions to increase HPV vaccination acceptance: A	The purpose of the current review is to summarize and evaluate the evidence for educational interventions to increase HPV vaccination acceptance.	Identified 33 studies of HPV vaccination educational interventions: 7 tested the effectiveness	Systematic Review	Search was restricted to English-language publications. Vast majority of reviewed studies comparing different message	33 studies of HPV vaccination educational interventions was identified: 7 tested the effectiveness of interventions with parents, 8 with adolescents or young adults, and	Level V	Given the association between HPV vaccination acceptance and individual knowledge, attitudes and beliefs, finding effective HPV vaccination educational interventions is essential to reducing HPV-

	<p>systematic review. <i>Vaccine</i>, 32(17), 1901-1920. https://doi.org/10.1016/j.vaccine.2014.01.091</p>		<p>ess of interventions with parents, 8 with adolescents or young adults and 18 compared the effectiveness of different message frames.</p>		<p>frames for HPV vaccination education were conducted in the U.S. (72%).</p>	<p>18 compared the effectiveness of different message frames in an educational intervention among adolescents, young adults or their parents. Well-designed studies adequately powered to detect change in vaccine uptake were rare and generally did not demonstrate effectiveness of the tested intervention.</p>		<p>associated morbidity and mortality.</p>
11	<p>Getrich, C. M., Broidy, L. M., Kleymann, E., Helitzer, D. L., Kong, A. S., Sussman, A. L., & RIOS Net Clinician. (2014). Different models of HPV vaccine decision-making among adolescent</p>	<p>Examine actual vaccination decision-making processes among clinicians, parents, and adolescents to identify strategies to enhance HPV vaccination uptake.</p>	<p>Hispanic mothers and daughters ages 12-18, healthcare clinicians, 22 questionnaires and</p>	<p>Mixed-method design</p>	<p>Clinical settings nationwide may be limited because of the subjects that were used. Small sample size and difference in vaccine</p>	<p>Findings demonstrated three aspects of vaccine delivery that were similar across clinics; availability /supply of vaccine. Identified three decision-making stages (pre-</p>	<p>Level IV</p>	<p>Yes, Factors other race and ethnicity, such as education, socioeconomic status, and health care access demonstrates how important its role in HPV vaccination decisions. This can better equip clinicians to explain benefits.</p>

	girls, parents, and health-care clinicians in New Mexico. <i>Ethnicity & Health</i> , 19(1), 47–63. https://doi.org/10.1080/13557858.2013.857767		30 interviews		delivery across the two clinics sites that influenced experiences in vaccine decision making that they did not detect.	encounter, encounter, and post-encounter) though they found a distinct difference in decision making processes at the two sites.		
12	Gilkey, M. B., Moss, J. L., Coyne-Beasley, T., Hall, M. E., Shah, P. D., & Brewer, N. T. (2015). Physician communication about adolescent vaccination: How is human papillomavirus vaccine different? <i>Preventive Medicine</i> , 77, 181-185. https://doi.org/10.1016/j.ypmed.2015.05.024	To identify opportunities for improving physicians' recommendations for HPV vaccination	776 physicians (53% pediatricians, 47% family medicine physician	Cross-sectional Online Survey	Limitations included a modest response rate, which is a common challenge for physician surveys. Self-report nature of physician communication variables, such as the strength of vaccine endorsement because social desirability may have prompted physician to	Above three-quarters of physician-reported recommending HPV vaccine as highly important for patients ages 11-12. 13% of physician-perceived HPV vaccine as being highly important to parents, which was or fewer than perceived parental support for Tdap. The physician reported that discussing HPV vaccine took	Level IV	Yes, the findings suggest that primary care physicians perceived HPV vaccine discussions to be burdensome, requiring more time thus less support of HPV vaccinations than other adolescent vaccines.

					overestimate their support for vaccines	almost twice as long as discussing other immunizations. Most 70% of physician discussed HPV last.		
13	Groom, H. C., Irving, S. A., Caldwell, J., Larsen, R., Beaudrault, S., Luther, L. M., & Naleway, A. L. (2017). Implementing a multipartner HPV vaccination assessment and feedback intervention in an integrated health system. <i>Journal of Public Health Management and Practice</i> , 23(6), 589-592. https://doi.org/10.1097/PHH.0000000000000562	To provide a guide for implementing a multipartner intervention to increase HPV vaccine initiation rates.	Nine primary care facilities within the Kaiser Permanente Northwest health care system	Literature Review	Coordination of presentations to the facility health care teams, given their many competing priorities. Missed opportunities from clinical staff members because of parental declination of vaccination rather than lack of provider recommendation.	Twelve months post intervention, HPV dose 1 vaccination coverage increased from 71% to 72% among females and from 65% to 68% among males.	Level V	Yes, this collaborative approach is critical to engaging leadership and enlisting support from military leadership and to developing appropriate material for military personnel. Information provided can be used as a guide for conducting assessment and feedback interventions focused on HPV vaccination initiation.

14	Hofstetter, A. M., Barrett, A., Camargo, S., Rosenthal, S. L., & Stockwell, M. S. (2017). Text message reminders for vaccination of adolescents with chronic medical conditions: A randomized clinical trial. <i>Vaccine</i> , 35(35), 4554-4560. https://doi.org/10.1016/j.vaccine.2017.07.022	Purpose of the study was to compare the effect of plain vs educational text message reminders on receipt of needed vaccines among adolescents with chronic conditions.	295 parents of chronic medical condition, adolescent s ages 11-18; 59.3% Spanish speaking; 77.6% had adolescent s with medical condition who were 13-17 years 92.5% were publicly insured	Randomiz ed control clinical trial	Given the unavoidable logistical gap between enrollment and randomization , approximately one-quarter of enrolled adolescents received all needed vaccines and were excluded. some parents did not complete additional survey items, which could have biased the findings.	Plain text messages more effective than educational text messages in short term.	Level I	Plain text message vaccine reminders appear to have a positive effect compared to educational ones in the short-term and for certain families. Highlight the potential for engaging subspecialty providers, although they face unique challenges, and using other novel technology-based approaches.
15	Huh, W. K., Joura, E. A., Giuliano, A. R., Iversen, O., de Andrade, R. P., Ault, K. A., Bartholomew, D., Cestero, R. M.,	Aimed to report efficacy of the 9vHPV vaccine for up to 6 years following first administration and antibody responses over 5 years.	Safety study of the 9vHPV vaccine study at 105 study sites in 18	Randomis ed, double-blind,	The study was limited in duration. Limitedly the use of an active control group,	In the per-protocol population, the incidence of high-grade cervical, vulvar and vaginal disease related to HPV	Level I	This study shows that many important individual clinical and global public health outcomes are prevented by 9vHPV vaccination: HPV infection, abnormal

	<p>Fedrizzi, E. N., Hirschberg, A. L., Mayrand, M., Ruiz-Sternberg, A. M., Stapleton, J. T., Wiley, D. J., Ferenczy, A., Kurman, R., Ronnett, B. M., Stoler, M. H., Cuzick, J., . . . Luxembourg, A. (2017). Final efficacy, immunogenicity, and safety analyses of a nine-valent human papillomavirus vaccine in women aged 16–26 years: A randomized, double-blind trial. <i>The Lancet</i>, 390(10108), 2143-2159. https://doi.org/10.1016/S0140-6736(17)31821-4</p>		<p>countries. Women aged 16–26 years old. Recruited and randomly assigned 14215 participants.</p>		<p>31, 33, 45, 52, and 58 was 0.5 cases per 10000 person-years in the 9vHPV and 19.0 cases per 10000 person-years in the qHPV groups, representing 97.4% efficacy (95% CI 85.0–99.9). HPV 6, 11, 16, and 18 GMTs were non-inferior in the 9vHPV versus qHPV group from month 1 to 3 years after vaccination. No clinically meaningful differences in serious adverse events were noted between the study groups. 11 participants died during the study follow-up period (six in the 9vHPV vaccine group and five in the qHPV</p>	<p>cytology, histological disease, and treatment procedures. The robust methods we used strengthened the clinical evidence to support vaccination for the prevention of HPV-related cancers. This data show that prophylactic administration of the 9vHPV vaccine is highly efficacious in preventing infection, cervical cytological abnormalities, histologically detected high-grade disease, and medical procedures associated with vaccine HPV types. Broad immunization of adolescent populations might result in such a substantial decrease in highgrade cervical disease that the evaluation of optimal screening algorithms in women vaccinated with the 9vHPV</p>
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						vaccine group); none of the deaths were considered vaccine-related.		vaccine will be necessary.
16	Johnson-Mallard, V., Darville, G., Mercado, R., Anderson-Lewis, C., & MacInnes, J. (2019). How health care providers can use digital health technologies to inform human papillomavirus (HPV) decision making and promote the HPV vaccine uptake among adolescents and young adults. <i>BioResearch Open Access</i> , 8(1), 84-93. https://doi.org/10.1089/biores.2018.0051	the purpose of this research study is to determine how health care providers can utilize digital health technologies (such as the internet, mobile phones, short message service [SMS] text messages, and mobile apps) to increase individual risk perception of the HPV virus, increase awareness about the HPV vaccine, overcome barriers to the HPV vaccine, and help adolescents and young adults make informed decisions to get the HPV vaccine.	A convenience sample of 210 students completed an online survey. Participants were 18–25 years of age (88%), female (85%), Caucasian (60%), and never been diagnosed with HPV (92.9%).	Randomized Sampling Survey	No limitations noted	The findings of this study indicated that work is needed in the acceptance of social media, SMS text messaging, and mobile Apps as preferred digital health technologies beyond the internet. Health care providers can educate parents and students with regard to navigating the health system to obtain health information by using text messages and mobile apps, easily and effectively.	Level III	Growing evidence support using digital health technologies to inform decision making to increase HPV risk perception and promote HPV vaccine uptake among adolescents and young adults. Digital health technology beyond the internet and online websites is warranted and when used appropriately can be a strategic and successful tool to inform decision making, increase perception, and promote HPV vaccine uptake. Text messaging can be used to receive updates from healthcare providers.

17	Krawczyk, A., Lau, E., Perez, S., Delisle, V., Amsel, R., & Rosberger, Z. (2012). How to inform: Comparing written and video education interventions to increase human papillomavirus knowledge and vaccination intentions in young adults. <i>Journal of American College Health, 60</i> (4), 316-322. https://doi.org/10.1080/07448481.2011.615355	To compare the efficacy of 2 human papillomavirus (HPV) educational interventions on increasing HPV knowledge and vaccination intentions in college students.	Male ($n = 60$) and female ($n = 140$) undergraduates	Quantitative Study	High SES of the sample, and therefore results may not be generalizable to a wider population of young adults.	Low baseline knowledge and intentions were found across groups. Post intervention, participants in the written and video interventions had significantly higher knowledge and intentions than the control. No differences were found between written and video interventions on knowledge or intention	Level III	Yes, written and video interventions are equally effective in educating about HPV and increasing young adults' vaccination intentions.
18	Kulczycki, A., Qu, H., & Shewchuk, R. (2016). Recommend, but also discuss: Different patterns of physician-	Understand the extent to which adherence to clinical guidelines, as indicated by the reported intentions of PCPs to prescribe HPV vaccination	Randomized sampling design, 301 pretested questionnaires	Survey Cohort Study	Data is self-reported and could not be checked through other methods, study assessed likelihood to	67% of the respondents said they were likely to prescribe HPV vaccination. 14% disagreed with the statement that professional	Level V	Yes, This study shows that the perceived lack of guideline clarity is associated with lesser stated likelihood to prescribe vaccine, which in turn is associated with lower

	perceived barriers to discussing HPV vaccination and their association with vaccine administration in 11–12 year-old girls. <i>Maternal and Child Health Journal</i> , 20(12), 2539-2547. https://doi.org/10.1007/s10995-016-2079-9		completed by family practitioners and pediatricians		prescribe HPV vaccination rather than its actual administration, and limited resources prevented a larger survey.	guidelines about HPV vaccination offered clear guidance and 22% of respondents categorically believed in mandated HPV vaccination		actual vaccination rates.
19	Manhart, L. E., Burgess-Hull, A. J., Fleming, C. B., Bailey, J. A., Haggerty, K. P., & Catalano, R. F. (2011). HPV vaccination among a community sample of young adult women. <i>Vaccine</i> , 29(32), 5238-5244. https://doi.org/10.1016/j.vaccine.2011.05.024	Despite the high efficacy of the human papillomavirus (HPV) vaccine, uptake has been slow and little data on psychosocial barriers to vaccination exist.	Community sample of 428 women enrolled in a longitudinal study of social development in the Seattle WA metropolitan area were interviewed	Cross-sectional study design	This was a predominantly white population; thus we were not able to carefully explore racial disparities. Additionally, we did not measure several key factors for HPV vaccine uptake (insurance	19% of women had initiated vaccination, 10% had completed the series, and ~40% of unvaccinated women intended to get vaccinated. Belief the vaccine is <75% effective was associated with less initiation (APR 0.6; 0.4–0.9) or intention to vaccinate (APR 0.5; 0.4–0.7).	Level III	The HPV vaccine has great potential to prevent cervical and other anogenital cancers. However, current vaccine coverage estimates are substantially below those required to see population level effects on HPV-related morbidity and mortality and much remains to be done to increase HPV vaccine uptake and

			d about HPV vaccine status, attitudes, and barriers to HPV vaccination in spring 2008 or 2009 at ~age 22.		coverage, discussion of vaccination with significant individuals), or where vaccinated women had received the vaccine and thus were unable to evaluate them. Finally, the cross-sectional study design precludes conclusions about causality	Vaccine initiation was also less likely among cigarette smokers and illegal drug users, whereas intention to vaccinate was more common among women currently attending school or with >5 lifetime sex partners, but less common among women perceiving low susceptibility to HPV.		completion. Focusing efforts on increasing knowledge about the widespread nature of HPV infection and the high levels of vaccine efficacy, along with peer interventions, may be most effective.
20	Miller, M. K., Wickliffe, J., Jahnke, S., Linebarger, J., & Humiston, S. G. (2014). Views on human papillomavirus vaccination: A mixed-methods	Conducted a mixed-methods study using the theory of planned behavior framework to explore attitudes and beliefs about HPV vaccination among urban, economically	Fifty adolescent s aged 14–18 years were recruited from community-based organizati	Mixed-method study	Results may not be generalizable to other racial/ethnic groups or youth outside of the Midwest. use of a	Less than half (40 %) of participants reported receipt of C1HPV vaccine dose. Among those who had received 1 doses (20 participants), seven completed the series, three	Level III	Study indicates a profound lack of awareness about HPV vaccination as well as the important influence of parents among urban, economically disadvantaged youth. Awareness of these

	study of urban youth. <i>Journal of Community Health</i> , 39(5), 835-841. https://doi.org/10.1007/s10900-014-9858-2	disadvantaged adolescents.	ons to complete a written survey and participate in a focus group		Caucasian moderator may have influenced communication among focus group participants.	received 1 or 2 doses, and 10 could not recall the number of doses received.		attitudes and beliefs can assist public health officials as well as providers by informing specific interventions to increase vaccine uptake
21	Mohammed, K. A., Geneus, C.J., Osazuwa-Peters, N., Adjei-Boakye, E., Tobo, B. B., & Burroughs, T. E. (2016). Disparities in provider recommendation of human papillomavirus vaccination for U.S. adolescents. <i>Journal of Adolescent Health</i> , 59(5), 592-598. https://doi.org/10.1016/j.jadohealth.2016.06.005	To determine the prevalence of and examine factors associated with provider recommendation of HPV vaccination for U.S. adolescents	Overall prevalence of vaccine recommendation was 72.6% for girls and 51.8 for boys. Girls had a higher odds of vaccine recommendation.	Cross-sectional Survey	The NIS-Teen data lacked provider specific information, such as demographic characteristics and provider specialties as well as barriers to vaccine recommendation. Could not confirm whether providers actually recommended HPV vaccine to the adolescent	This study demonstrated lower HPV vaccine recommendation for boys, adolescents below poverty line, those with lesser educated mothers, and those who live in the South. Findings indicate important disparities in vaccine recommendation that must be addressed to achieve optimal vaccine uptake among high risk population.	Level II	Yes, this study highlights significant disparities in provider recommendation of HPV vaccination for U.S. adolescents. Findings suggest possible areas for tailored interventions to bridge the gap in vaccine recommendation and uptake in high risk population.

22	Mullins, T. L. K., Griffioen, A. M., Glynn, S., Zimet, G. D., Rosenthal, S. L., Fortenberry, J. D., & Kahn, J. A. (2013). Human papillomavirus vaccine communication: Perspectives of 11–12 year-old girls, mothers, and clinicians. <i>Vaccine</i> , 31(42), 4894-4901. https://doi.org/10.1016/j.vaccine.2013.07.033	Study explored communication between 11- and 12 year-old girls, mothers, and clinicians regarding HPV vaccines and concordance in reports of maternal and clinician communication.	Conducted individual interviews with 33 girls who had received the quadrivalent HPV vaccine in urban and suburban clinical settings, their mothers, and their clinicians.	Qualitative Interview	Interviews were conducted using a sample from one geographic location. Participants may not remember or report all of the information that was discussed with regard to HPV vaccination, particularly if discussions occurred over several visits. Some clinicians were interviewed more than once; results could be skewed by over-representation	From the perspectives of both girls and mothers, clinicians and parents were the preferred sources of HPV vaccine information for girls. Vaccine efficacy and risks/benefits of vaccination were the most commonly reported desired and actual topics of discussion by mothers, girls, and clinicians. Clinician recommendation of vaccination was reported by nearly one-fifth of girls and nearly half of mothers.	Level VI	HPV vaccine efficacy and safety are important topics for clinicians to discuss with both girls and mothers; educating mothers is important because parents are a preferred source of vaccine-related information for girls. Because girls may be missing important vaccine-related messages, they should be encouraged to actively engage in vaccine discussions.
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23	Oldach, B. R., & Katz, M. L. (2012). Ohio Appalachia public health department personnel: Human papillomavirus (HPV) vaccine availability, and acceptance and concerns among parents of male and female adolescents. <i>Journal of Community Health, 37</i> (6), 1157-1163. https://doi.org/10.1007/s10900-012-9613-5	Update information regarding the demand, availability, recommendation, and barriers of HPV Vaccination for males and females in Appalachia Ohio.	Public health/immunization nurses, directors of public health nursing, one public health supervisor of 46 public health departments identified as Appalachia	Semi-structured questionnaire with interviews	Participants in the study provided an estimation of the number of requests for HPV vaccines. The generalizability of the results is limited by conducting the study among health department serving only Appalachia Ohio.	Health departments reported 15 barriers to HPV vaccination among patients or parents of patients. Some include lack of knowledge, concern about side effects, the vaccine may cause sexual promiscuity, vaccine series completion, religious beliefs, and cancer does not run in my family.	Level V	Yes, findings suggest that parents of males and parents of females may have different informational needs and may respond to different messages when making an informed decision about HPV vaccination for their children. This can identify ways to help clinicians with pushing for the vaccination
24	Patel, D. A., Zochowski, M., Peterman, S., Dempsey, A. F., Ernst, S., & Dalton, V. K. (2012).	To examine human papillomavirus (HPV) vaccine intent and the effect of an educational intervention on vaccine uptake	Females aged 18 to 26 attending a university health service	Randomized Study	Study focused on females seeking routine health maintenance at a UHS, the study population	At baseline, 41% intended to undergo HPV vaccination. Participants who were currently sexually active and lacked	Level I	Interventions to increase HPV vaccine uptake in college students should address HPV-related beliefs and broader barriers to vaccination.

	Human papillomavirus vaccine intent and uptake among female college students. <i>Journal of American College Health</i> , 60(2), 151-161. https://doi.org/10.1007/s10900-012-9613-5	among female college students. P	gynecology clinic (n = 256).		may not reflect the overall population of college-aged women at our institution, women of the same age range in other university settings, or women of the same age range who do not attend college.	supplemental health insurance had decreased intent. Perceived parental approval regarding HPV vaccination, perceived vulnerability to HPV infection, and belief in health benefits of HPV vaccine were associated with increased intent. HPV vaccine uptake was low (5.5%) and did not differ by study group. However, baseline intent was significantly associated with HPV vaccine uptake.		
25	Pearson, A. L., Kvizhinadze, G., Wilson, N., Smith, M., Canfell, K., &	Explore the cost-utility of girls-only HPV vaccination, to estimate quality-adjusted life years (QALYs) gained and	Markov macro-simulation model, for an annual cohort of	Cohort Randomized Study	The lack of local data to build a dynamic HPV infection model and	The modeling results indicated that the estimated intervention costs rose with increasing	Level III	New evidence of lower vaccine bulk prices tendered by developed countries becomes available, future modeling may

	Blakely, T. (2014). Is expanding HPV vaccination programs to include school-aged boys likely to be value-for-money: A cost-utility analysis in a country with an existing school-girl program. <i>BMC Infectious Diseases</i> , 14(1), 351-365. https://doi.org/10.1186/1471-2334-14-351	net health system costs, for girls-only and girls and boys vaccination	12-year-olds in 2011		thus, our reliance on HPV reduction results from a Canadian dynamic model.	coverage levels and when adding boys to the girls-only programs. QALY gained increased with higher coverage levels. The health sector would get the best value-for-money by further improving HPV vaccination coverage for girls, rather than adding in the vaccination of boys.		be worthwhile as it is likely to suggest improvements in cost-effectiveness
26	Piedimonte, S., Leung, A., Zakhari, A., Giordano, C., Tellier, P., & Lau, S. (2018). Impact of an HPV education and vaccination campaign among Canadian university	Objective was to determine the level of knowledge related to HPV and cervical cancer among university students and to subsequently develop a targeted education and vaccination campaign to increase uptake.	151 participants	Semi-structured questionnaire with interviews	The low participation and in-ability to provide continuous services from residents and medical students.	Phase I, 56 participants responded to a questionnaire related to HPV knowledge and cervical cancer. Among these, 29 students were vaccinated in a 2-day resident-run clinic. Overall,	Level V	HPV vaccination rates in university students are readily increased through educational campaigns, of which person-solicitation proved to be the most fruitful in this study.

	students. <i>Journal of Obstetrics and Gynecology Canada</i> , 40(4), 440-446. https://doi.org/10.1016/j.jogc.2017.07.028					63% felt they were not at risk of cervical cancer, though 88% knew HPV was the cause of cervical cancer.		Identifying barriers to vaccination can guide future initiatives to maximize impact.
27	Rand, C.M., Vincelli, P., Goldstein, N. P., Blumkin, A., & Szilagyi, P. G. (2017). Effects of phone and text message reminders on completion of the human papillomavirus vaccine series. <i>Journal of Adolescent Health</i> , 60(1), 113-119. https://doi.org/10.1016/j.jadohealth.2016.09.011	To assess the effect of phone or text message reminders to parents of adolescents on (HPV) vaccine series completion in Rochester, NY.	Urban primary care clinics, parents of adolescents ages 11-17 years, 358 in phone reminder group and 391 in text message reminder group	Randomized controlled trials	Study occurred in one city in upstate New York and had a limited sample size. Moreover, study personnel rather than office staff tracked the data and sent messages; thus, further work is needed to implement sustainable models of patient reminder recall for	In this urban population of parents of adolescents, text message reminders for HPV vaccine completion for those who had already started the series were effective, whereas phone message reminders were only effective for those enrolled at dose 1.	Level I	More research is needed to test the effectiveness of large-scale population-level text message reminders for adolescent immunizations and office-based interventions that could improve rates.

					HPV vaccination.			
28	Real, F. J., Rosen, B. L., Bishop, J. M., McDonald, S., DeBlasio, D., Kreps, G. L., Klein, M., & Kahn, J. A. (2021). Usability evaluation of the novel smartphone application, HPV vaccine: Same way, same day, among pediatric residents. <i>Academic Pediatrics, 21</i> (4), 742-749. https://doi.org/10.1016/j.acap.2020.11.023	Characterize resident clinicians' perceptions regarding the usability of the HPV Vaccine: Same Way, Same Day smartphone application (app). Usability, a critical aspect of digital programs to promote behavior change, was evaluated.	Fifteen third-year pediatric residents were recruited to complete a usability evaluation of the HPV Vaccine: Same Way, Same Day app,	Qualitative Study	There was the possibility of self-selection bias as participants with increased interest in technology-based education or vaccine delivery might have chosen to contribute and positively skewed results. Second, they did not report the impact of our intervention on patients' HPV vaccination rates.	Twenty (51%) of 39 eligible residents completed initial enrollment. Fifteen (75%) of the enrolled residents completed all aspects of the study. Residents described the app as interactive, easy to use, succinct, informative, engaging, and practical. All residents would recommend the HPV Vaccine: Same Way, Same Day app to a colleague. Residents suggested adding more complex cases for future iterations.	Level II	From their perspective, pediatric residents reported that an app using deliberate practice principles has the potential to inform and advance providers' counseling skills regarding the HPV vaccine.
29	Reiter, P. L., McRee, A.,	Examining parents' and adolescents'	Parents of Adolescen	Mixed design	Survey did not address	Parents and sons were most	Level V	Yes, offering HPV vaccine in alternative

	Pepper, J. K., Chantala, K., & Brewer, N. T. (2012). Improving human papillomavirus vaccine delivery: A national study of parents and their adolescent sons. <i>Journal of Adolescent Health, 51</i> (1), 32-37. https://doi.org/10.1016/j.jadohealth.2012.01.006	preferences regarding potential strategies to increase HPV vaccination rates.	t boys 11-17 (n=506) and their sons (n=391)		other potentially important issues of HPV vaccination in alternative settings, such as the process of obtaining consent for vaccination.	comfortable with sons receiving HPV vaccine in a doctor's office. Parents of sons who had not visited their regular health care providers in the past year were more comfortable with sons receiving HPV vaccine at a public clinic compared with parents whose sons had recent visits.		settings and administering it with other recommended adolescent vaccines may increase uptake among adolescent boys. Parents and sons may prefer HPV vaccines be administered during brief nurse visits.
30	Rutten, L. J. F., Sauver, J.L., Beebe, T. J., Wilson, P. M., Jacobson, D. J., Fan, C., Jacobson, R. M. (2017). Clinician knowledge, clinician barriers, and perceived parental barriers regarding human papillomavirus	Researchers tested the hypothesis that clinician knowledge, clinician barriers, and perceived parental barriers relevant to the human papillomavirus (HPV) vaccination account for the variation in vaccine delivery at the practice-site level.	n = 280 in a 27-county geographic region	Cross-sectional Study	Using clinical data is that patients may have had vaccinations in other locations, which may lead to an underestimate of vaccination rates.	A total of 685 clinicians were sent the survey and 280 returned the survey resulting in an overall response rate of 41.0%. A total of 52 clinical sites were represented. Using administrative data, we assessed	Level V	Identification of practice sites with knowledge gaps and corresponding lower rates of vaccination will guide efforts to design interventions that can overcome the knowledge gaps and improve HPV vaccine delivery. Furthermore, understanding frequently encountered negative

	<p>vaccination: Association with initiation and completion rates. <i>Vaccine</i>, 35(1), 164-169. https://doi.org/10.1016/j.vaccine.2016.11.012</p>					<p>whether there were any significant differences between survey responders and non-responders by medical specialty and geographic region. No differences were observed by medical specialty (P=0.3). Response rates were higher in the Rochester area and lower in the southeastern Minnesota region (P=0.003).</p>		<p>clinician attitudes and perceived parental barriers provides insight into the factors to be addressed when designing clinician- and parent-directed interventions.</p>
31	<p>Smith, L. M., Kaufman, J. S., Strumpf, E. C., & Lévesque, L. E. (2015). Effect of human papillomavirus (HPV) vaccination on clinical indicators of sexual</p>	<p>Suboptimal human papillomavirus (HPV) vaccine coverage in some jurisdictions is partly attributed to fears that vaccination may increase risky sexual behavior. We assessed the effect of HPV vaccination on</p>	<p>128, 712 8th grade females from Ontario health database</p>	<p>Quasi-experimental Design</p>	<p>Limitations due to only screening this geographical area and not national.</p>	<p>128,712 were eligible. They identified 15,441 (5.9%) cases of pregnancy and sexually transmitted infection and found no evidence that vaccination</p>	<p>Level V</p>	<p>Yes, strong evidence that HPV vaccination does not have any significant effect on clinical indicators of sexual behavior among adolescent girls. These results suggest that concerns over increased promiscuity</p>

	<p>behavior among adolescent girls: The Ontario grade 8 HPV vaccine cohort study. <i>Canadian Medical Association Journal</i>, 187(2), E74-E81. https://doi.org/10.1503/cmaj.140900</p>	<p>clinical indicators of sexual behavior among adolescent girls in Ontario.</p>				<p>increased the risk of this composite outcome</p>		<p>following HPV vaccination are unwarranted and should not deter from vaccinating at a young age</p>
32	<p>Staras, S. A. S., Vadaparampil, S. T., Thompson, L. A., Scherr, C., Gurka, M. J., Filipp, S. L., & Shenkman, E. A. (2020). Postcard reminders for HPV vaccination mainly primed parents for providers' recommendations. <i>Preventive Medicine Reports</i>, 20, 101188. https://doi.org/10.1016/j.pmr.2020.101188</p>	<p>Assessed the percentage increase in HPV vaccine initiation from reminders increasing preventive care visits or increasing the likelihood of vaccine receipt during preventive care.</p>	<p>2,470 Girls enrolled in the trial: were 11 to 17 years old, enrolled in Florida Medicaid or Children's Health Insurance Program (CHIP), had a regular office visit</p>	<p>Quasi-experimental Randomized Survey</p>	<p>Medicaid and CHIP data likely have incomplete vaccination records. Because we randomized postcard assignment, the incompleteness in the vaccination records should be balanced across arms and have little</p>	<p>Postcard messages primarily increased HPV vaccination by increasing parents' receptivity to providers' HPV vaccine recommendations. Combining reminders with many of the efficacious provider-targeted interventions (e.g., Brewer's announcement</p>	<p>Level III</p>	<p>Decreasing the time between vaccine reminders and preventive care appointments may maximize the priming effect of reminders. Multi-level interventions should consider including reminders as priming agents for parents combined with an intervention to increase provider recommendation frequency and strength.</p>

	1016/j.pmedr.2020.101188		between July 1, 2011 and August 1, 2013		influence on the results. Second, the postcards were sent in 2013 to parents in Northern Florida. In recent years, HPV vaccine initiation rates have increased, but remain low	strategy) will likely produce stronger synergistic effects than combining reminders with increased preventive care access		
33	Thompson, E. L., Vamos, C. A., Sappenfield, W. M., Straub, D. M., & Daley, E. M. (2016). Relationship status impacts primary reasons for interest in the HPV vaccine among young adult women. <i>Vaccine</i> , 34(27), 3119-3124. https://doi.org/10.1016/j.vaccine.2016.04.063	The purpose of this study was to assess show relationship status impacts interest in HPV vaccination and primary reasons for non-vaccination among 18-26 year old young women.	The National Health Interview Survey 2010 was examined among unvaccinated females, 18–26 years (N = 1457).	Cross-sectional randomized survey	This study was limited by self-reported data for HPV vaccination and limitation of response rate.	Among unvaccinated women, 31.4% were interested in the HPV vaccine. Women who were living with a partner (PR = 1.45, 95%CI 1.06–1.90) and single (PR = 1.42, 95%CI 1.11–1.76) were significantly more likely than married women to be interested in the HPV vaccine,	Level III	Relationship status in young adulthood impacts HPV vaccine interest and decision-making among a national sample of women. Primary reasons for non-interest in the vaccine may be shaped by attitudes and knowledge about the HPV vaccine that differ by relationship status. Future research is needed to elucidate ways to overcome relationship status as a

						<p>while controlling for socio-demographic and other known risk factors. Additionally, primary reasons for non-vaccination differed based on relationship status among uninterested women ($p < 0.01$). Women who were married were more likely to cite not needing the vaccine compared to never married women ($p < 0.05$).</p>		barrier to HPV vaccination.
34	Thompson, E. L., Vamos, C. A., Vázquez-Otero, C., Logan, R., Griner, S., & Daley, E. M. (2016). Trends and predictors of HPV vaccination among U.S.	The purpose of this study was to assess the trends in HPV vaccination among U.S. college females and males from 2009 to 2013, and to examine whether predictors for HPV vaccination differ	Majority of respondents were female (71.1%). Males (59.0% females, 29.8%	Cross-sectional randomized Survey	Data were cross-sectional, which limit the ability to establish temporality between the time of HPV vaccination	Females had nearly double the rates of HPV vaccination compared to males over time. All demographic sub-groups had significant increases in	Level III	These findings identified specific demographic sub-groups that need continued support for HPV vaccination. Campus health centers may be rational settings to facilitate clinical opportunities

	college women and men. <i>Preventive Medicine</i> , 86, 92-98. https://doi.org/10.1016/j.ypmed.2016.02.003	between males and females.	males. Ages of 18 and 21 years, heterosexual (92.8% females, 91.4% males. Non-Hispanic White (67.4% females, 65.2% males. Reported not being in a relationship (51.2% females, 60.3% males) and single, not married (93.2% females, 93.2% males.		and certain modifiable variables (e.g., relationship and marital status). Didn't specify how many of the recommended three doses of the HPV vaccine participant's received. Measurement of race/ethnicity changed between study periods, which prohibited the comparison of vaccination continuously across all study periods.	vaccine rates over time, with select male sub-groups having more accelerated increases (e.g., gay). Young age (18–21 vs. 22–26 years) was a significant predictor for HPV vaccination among males and females, while race/ethnicity was a predictor of vaccination among females only.		for HPV vaccination among unvaccinated college students.
35	Vanderpool, R. C., Cohen, E. L.,	Identified correlates of intent to complete	344 Young	Cross-sectional	Cross-sectional	Positive intent to complete the	Level III	Findings suggest the potential for

	<p>Crosby, R. A., Jones, M. G., Bates, W., Casey, B. R., & Collins, T. (2013). "1-2-3 Pap" Intervention improves HPV vaccine series completion among Appalachian women. <i>Journal of Communication</i>, 63(1), 95-115. https://doi.org/10.1111/jcom.12001</p>	<p>the vaccine series and actual series completion, but also tested the efficacy of a DVD intervention to promote HPV vaccine series completion</p>	<p>women ages 18-26 from an eight-county catchment area of Appalachian Kentucky in the United States.</p>	<p>Randomized Study</p>	<p>nature of the baseline survey does not allow for measuring temporal changes in health-related attitudes and beliefs, the influence of subjective norms, perceived behavioral control, and behavioral intentions.</p>	<p>vaccine series was indicated by 64.3% of the women (n=220). Just over one-third (37.8%) of the sample completed the three-dose series. Positive intent was indicated by 58.2% of those randomized to the intervention condition and 70.9% in the control condition (p=.014). Nearly half of the women (43.3%) randomized to the DVD intervention completed the 3-doseseries, whereas 31.9% of women assigned to the comparison group completed the series, for a percent relative difference of 35.7% (p=.03).</p>		<p>translating this approach to other vaccination contexts in which adherence to a multiple dosage regimen is necessary.</p>
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36	Wiley, R., Shelal, Z., Bernard, C., Urbauer, D., Toy, E., & Ramondetta, L. (2019). Team-based learning module for undergraduate medical education: A module focused on the human papilloma virus to increase willingness to vaccinate. <i>Journal of Cancer Education, 34</i> (2), 357-362. https://doi.org/10.1007/s13187-017-1311-7	A team-based learning (TBL) module focused on HPV for first-year medical students about HPV will better increase knowledge and likeliness to vaccinate than traditional education methods.	239 students were invited to participate in the pre-test survey at McGovern Medical School. Ninety-three students responded to the initial survey (rate = 38.9%) and of those, 61 completed the post-test survey,	Qualitative Randomized Study	Post-test scores may be inflated due to recall bias from the recent instruction of HPV teaching compared with students surveyed across the state. The unknown of how knowledge obtained in medical school will translate into future practice	Students showed a significant improvement in general and vaccine-related HPV knowledge, equal to the knowledge among graduating medical seniors across the state and superior specifically in the case of vaccine-related knowledge. Students made the greatest gains in knowledge regarding which cancers and precancerous diseases are associated with HPV, and general knowledge of high-risk HPV	Level IV	It appears that a dedicated active learning module on human papillomavirus significantly improves future medical practitioners comfort with HPV related cancers and willingness to advocate for vaccinations. As medical schools are training the physicians that will be on the front lines, working to prevent HPV-related disease, a dedicated module on HPV, may be one tool to help increase uptake of vaccinations.
37	Wilson, A. R., Hashibe, M., Bodson, J., Gren, L. H., Taylor, B. A., Greenwood, J., Jackson, B. R.,	To assess the demographic and attitudinal factors associated with HPV vaccine initiation and completion	Two groups of women ages 18-26. 325 Surveys	Cross Sectional Survey	Limitations identified were generalizability of the current study.	Results of this study illustrate that awareness is already high (near saturation) in	Level III	The implications of these findings may help inform policies and interventions focused on increasing

	<p>She, R., Egger, M. J., & Kepka, D. (2016). Factors related to HPV vaccine uptake and 3-dose completion among women in a low vaccination region of the USA: An observational study. <i>BMC Women's Health</i>, 16(1), 41-41. https://doi.org/10.1186/s12905-016-0323-5</p>	<p>among 18-26 year old women in Utah.</p>	<p>Completed 1 dose (n=204) and 3 dose (n=159)</p>		<p>One of the primary limitations was the low survey return rate. Even after incentivizing a second wave of survey dissemination, response rates totaled well under 30 %.</p>	<p>target populations and other factors, such as strong and consistent physician recommendations are more pivotal in increasing likelihood of vaccination. Additionally, findings indicate the need for discussions of risk assessment be tailored to the young adult population</p>		<p>HPV vaccination rates among young women.</p>
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ACCEPTANCE AND INITIATION OF THE HPV VACCINE

Appendix C: CITI Training Certificate



Completion Date 23-May-2021
Expiration Date 22-May-2024
Record ID 39391815

This is to certify that:

Millie Knox

Has completed the following CITI Program course:

Social & Behavioral Research - Basic/Refresher
(Curriculum Group)
Social & Behavioral Researchers
(Course Learner Group)
1 - Basic Course
(Stage)

Under requirements set by:

Liberty University

Not valid for renewal of certification through CML.



Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/7w5df91194-616c-44f9-b447-63a1f62be0de-39391815

ACCEPTANCE AND INITIATION OF THE HPV VACCINE

Appendix D: IRB Approval Documentation

6/23/2021

Mail - Knox, Millie - Outlook

[External] IRB-FY20-21-987 - Initial: Initial - Non-Human Subjects Research

do-not-reply@cayuse.com <do-not-reply@cayuse.com>

Fri 6/11/2021 8:22 AM

To: Knox, Millie <miknox6@liberty.edu>; Moore, Vickie B (Doctoral Nursing) <vbmoore@liberty.edu>

[EXTERNAL EMAIL: Do not click any links or open attachments unless you know the sender and trust the content.]

LIBERTY UNIVERSITY. INSTITUTIONAL REVIEW BOARD

June 11, 2021

Millie Knox
Vickie Moore

Re: IRB Application - IRB-FY20-21-987 Increasing HPV vaccinations rates among adolescents and young adults

Dear Millie Knox and Vickie Moore,

The Liberty University Institutional Review Board (IRB) has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study does not classify as human subjects research. This means you may begin your project with the data safeguarding methods mentioned in your IRB application.

Decision: No Human Subjects Research

Explanation: Your study is not considered human subjects research for the following reasons:

- (1) It will not involve the collection of identifiable, private information.
- (2) Evidence-based practice projects are considered quality improvement activities, which are not "designed to develop or contribute to generalizable knowledge" according to 45 CFR 46.102(l).

Please note that this decision only applies to your current application, and any modifications to your protocol must be reported to the Liberty University IRB for verification of continued non-human subjects research status. You may report these changes by completing a modification submission through your Cayuse IRB account.

If you have any questions about this determination or need assistance in determining whether possible modifications to your protocol would change your application's status, please email us at irb@liberty.edu.

Sincerely,

G. Michele Baker, MA, CIP