Increasing HPV Vaccination Rates

for Undergraduate Students

at a Public University

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Abstract

Background: Human papillomavirus (HPV) is a sexually transmitted infection that can lead to cancers of the vulva, penis, cervix, oropharynx, and anus. Many sexually active adults will be exposed to HPV in their lifetime. HPV vaccination is a way to reduce the spread of HPV infection which can decrease the number of HPV-related cancers. Gardasil 9 is the vaccination approved for the prevention of HPV, which protects against HPV types 16,18,31,33,45,52, and 58. HPV vaccination is approved for individuals aged 9-45 years of age. **Purpose:** This quality improvement (QI) project involves using a health education campaign to increase HPV vaccination rates at a public university. **Methods:** The Plan-Do-Study-Act (PDSA) model was used in implementing this QI project. The interventions include social media advertisements, educational sessions, and an HPV vaccination clinic. **Results:** HPV vaccination uptake increased after the health education campaign concluded. **Recommendations:** Future recommendations include focusing on effective advertisements, HPV vaccination requirements, and increased collaboration among stakeholders.

Background and Significance

Human Papillomavirus (HPV) is one of the most common sexually transmitted infections (STIs) in the United States (U.S). Approximately 79 million people within the U.S are infected with HPV and an additional 14 million new cases of HPV are reported annually. Approximately 85% will be exposed to an HPV infection within their lifetime (Albright et al., 2018; CDC, 2021c; McLendon et al., 2021). HPV can cause secondary genital warts and cancers within the oropharynx, cervical, vaginal, vulvar, anal, and penile regions. Many of these HPV-associated cancers have no methods of screening to detect early cancer cases. Cervical cancer is the only disease with a method of routine screening for early detection. According to the Centers for

Disease Control and Prevention (CDC), approximately 35,900 people are diagnosed with cancer associated with HPV annually, and cervical cancer is the most prevalent cancer caused by HPV with an estimated 11,000 cases annually in the U.S (CDC,2021b). HPV has the highest incidence among individuals in their late adolescence to early adulthood stages of life since these individuals are more likely to engage in higher-risk sexual activity such as multiple sexual partners and unprotected sex (CDC, 2021b; McLendon et al., 2021). The utilization of HPV vaccination can help mitigate increasing transmission among the young adult population.

HPV vaccination is a safe and available method for HPV prevention within the U.S. The use of vaccinations could prevent over 90% of cancer caused by HPV, which could result in 33,000 fewer cancer cases annually (CDC,2021b). In 2006, the first HPV vaccinations became available to individuals 9-26 years of age, now vaccinations are approved for individuals 9-45 years of age (McLendon et al., 2021). After 2016, Gardasil 9 has become the only available vaccine within the U.S with protection against the most high-risk strains of HPV (16, 18, 31, 33, 45, 52, and 52). (CDC, 2021c; McLendon et al., 2021). The routine vaccination process is recommended for individuals 11-12 years of age, with the highest efficacy being shown till age 26. The vaccination process is given in 2 doses, or 3 dose schedules based on age. The national guidelines are based on the Advisory Committee on Immunization Practices (ACIP) recommended vaccination schedule which states individuals 9-14 years of age can be given the two-dose series and individuals 15-45 years of age can be given the three-dose series (CDC,2022a; CDC,2022b). Individuals less than age 15 receive an initial dose and a second dose 6-12 months later, individuals 15 years and older receive 3 doses, an initial dose, a second dose at 1-2 months, and a 3rd dose at least 6 months after the initial dose (CDC, 2021d).

Low vaccination rates can be attributed to many factors such as low health literacy and perceived health benefits among individuals who constitute the adolescent thru young adult population. The 2030 Healthy People initiative set a goal to reach an 80% vaccination rate for adolescents aged 13-15, about 48% of this group received recommended doses by 2018 (ODPHP, 2022). Many individuals are missing the target age range (11-12 years) for HPV vaccination; this has guided public health programs to target individuals between ages 15-26 years old. Partnering with college campuses to increase HPV vaccination rates could be a promising strategy (Albright et al., 2018; Gerend et al., 2020; Kessler et al., 2021; McLendon et al., 2021). Providing education to college students can increase knowledge of risk and facilitate positive attitudes towards HPV vaccination (Albright et al., 2018). Initiatives towards increased vaccination rates can be guided towards addressing educational gaps, provider-centered education, and identifying barriers.

Purpose

This quality improvement project aims to improve HPV vaccination rates among undergraduate students at a public university. An educational program and awareness initiative will be used to increase vaccination uptake.

Review of Current Evidence

An extensive literature review was conducted to gain knowledge on HPV vaccination uptake among college students. The search was conducted by using PubMed and CINHAL. Keywords included HPV, female, male, 18-26 years old, undergraduate, and college students. PubMed and CINHAL provided 250 results when searching for articles using the inclusion criteria. The research articles obtained were within the years 2016-2022. These articles used were identified by reviewing the abstracts to determine their use for the project. The inclusion criteria involved peer-reviewed articles, adults aged 18-26, English language, college students, and the United States. The reference list includes 25 articles that met the criteria for this project.

The Health Belief Model (HBM) acts as a framework that helps identify and shift an individual's perceptions of risk related to their health. HBM principles are based on the patient's perception of the risk of illness and actions that will help the patient avoid illness. The four factors related to HBM involve perceived susceptibility of illness/disease, belief in risk, belief in certain actions reducing risk, belief that actions outweigh the cost (Houlden et al., 2021). The factors that will be addressed in this QI project involve perceived susceptibility of illness/disease, belief in risk, and belief in certain actions reducing risk. The target population within this project is a high-risk group who are unvaccinated. This model will help college students gain more knowledge on HPV and use this knowledge to make better decisions in reference to HPV vaccination.

Barriers to HPV Vaccination

HPV vaccination uptake is determined by the information provided for college students during their lifetime. Surveys and in-depth interviews capture the gaps in knowledge among college students regarding HPV awareness Several studies used a survey to determine HPV knowledge and attitudes among college students at major universities in the southern region of the United States (U.S). Students were asked questions based on HPV awareness, vaccination history, perceptions, experiences, and knowledge (Kasymova et al.,2019; McLendon et al., 2021). Furthermore, 90% of college students within the study were aware of HPV and HPV vaccination, most of the knowledge came from a healthcare provider, school education class, or internet resources (Kasymova et al., 2019). A questionnaire to study the origin of HPV-related knowledge for students at a university within the Northeastern and Midwestern regions of the United States concluded that HPV vaccination awareness is influenced by provider recommendations or social influence. Grantham et al. (2020) determined most female students originally obtained information on HPV from their parents or physician, while many male students did not receive any information from their physician. Furthermore, many male students obtained information about HPV from advertisements on television (Grantham et al.,2020; McLendon et al.,2021; Stout et al., 2020). The students that received a provider's recommendation were about 5 times more likely to receive the HPV vaccination and students whose parent's recommended vaccination were 18 times more likely to receive the vaccination (McLendon et al., 2020). Many college students have a lack of awareness of HPV which creates a barrier contributing to low HPV vaccination uptake.

A qualitative study included semi-structured interviews with 20 college students at a Midwestern university within the U.S, to evaluate misconceptions of HPV and the human immunodeficiency virus. The interviews gathered several themes related to susceptibility, perception on prevalence/transmission, confusion about prevention, severity, stigma clouding severity, and accurate facts woven with confusion. The responses indicated the significance of provider-patient communication and health campaigns. Furthermore, the information provided from health campaigns can become confusing and glamorize the disease, it is important for healthcare providers to clarify education on HPV for patients (Hernandez et al.,2020).

Since many factors contribute to the lack of HPV awareness, determining causative factors is a significant solution to increasing HPV vaccination. Thompson et al. (2016) conducted a study using secondary data from a National College Health Assessment II survey to determine factors that can increase HPV vaccination uptake. A sample of 24,404 students aged 18-26 from 51 colleges/universities were included in the analysis. According to Thompson et al. (2016), educational information on HPV vaccination can be provided during other health services, such as flu vaccine clinics, gynecological exams, and regular health exams at Student Centers. This study suggested that Student Health Centers may need to examine and revise their protocol related to providing HPV education (Thompson et al., 2016). The data focuses on vaccinated versus unvaccinated individuals and the factors associated with each group. The data indicated that many unvaccinated students were eligible for HPV vaccination and freshmen were more likely to be vaccinated versus upperclassmen (Thompson et al., 2016).

Health Beliefs, Misconceptions, and Health Literacy

The lack of HPV vaccination uptake is related to several factors such as misconceptions, attitudes, health literacy, and health beliefs. Several studies conducted surveys were conducted with college students located at a Midwestern and Southeastern University to determine health literacy, HPV awareness/knowledge, attitudes, and perception of health beliefs (Albright et al.,2018; Grace-Leitch et al.,2016; Rose et al.,2018). A common misconception among college students includes a low perceived risk of contracting HPV which results in many students showing no interest in vaccination. Furthermore, this presents as a major misconception when an estimated 80-90% of sexually active adults will be infected with HPV in their lifetime. Health beliefs and knowledge influence the attitudes toward HPV vaccination among college students (Albright et al., 2018; Christy et al., 2016; D'Errico et al., 2021; Grace-Leitch et al., 2016; Rose et al., 2018).

Health Campaigns

Determining effective methods to disburse HPV information to college students is pivotal to increasing HPV vaccination uptake. Hayes et al. (2018) detail an educational intervention at an urban university in the U.S by pharmacy students. A two-phase intervention was used to produce the campaign: phase one involved a needs assessment survey/intervention design, and phase two

included implementation of student-led HPV education sessions. The education sessions involved 5 stations that involve different topics related to HPV vaccination (Hayes et al.,2018). Education sessions were beneficial in decreasing perceived barriers to vaccination and increasing health beliefs towards vaccination uptake. A study by Thompson et al.'s (2016) suggests encouraging HPV vaccination while providing flu vaccination and gynecological services at Student Health Center. The key is to determine times when students will be able to receive HPV education and address health beliefs (Thompson et al.,2016).

Furthermore, the use of student-led HPV education programs could be beneficial to target the college population. A student-led HPV awareness campaign was used to increased HPV vaccination uptake at a major university in the U.S. The campaign involved HPV awareness material displayed around campus (vard signs, posters within heavy traffic areas, weekly social media posts, and large banners), HPV vaccination training for student health providers, and themed buttons for healthcare providers to wear (Gerend et al., 2019). A John Hopkins University study used a campus-wide HPV awareness messaging and provided a toolkit to educate student health providers on strategies to improve HPV vaccination. The study also included an electronic medical record (EMR) form to prompt providers to discuss HPV vaccination with students. These studies demonstrated an improvement in HPV vaccination uptake after interventions were executed with a 70% increase in HPV vaccination uptake after the campaign was initiated (Gerend et al., 2019; Kessler et al., 2021) A relatively low-cost student-led educational campaign can be significant to increasing HPV vaccination uptake at universities. Furthermore, education for healthcare providers regarding the importance of HPV vaccination is important for increasing HPV uptake. Many students regard providers as one of the primary reasons they received the HPV vaccination.

Methods

Design

A QI project will be used to increase HPV vaccination rates within the college population. There is a significant level of importance related to addressing health literacy and barriers to HPV vaccination. Providing opportunities for increased awareness of HPV vaccination and ways for college students to have their gaps in health literacy addressed is pivotal for this project. The use of a health campaign to improve HPV vaccination has been demonstrated in a previous study. The health campaign uses educational opportunities, flyers, social media, and student health providers as interventions for quality improvement (Gerend et al.,2019). A voluntary survey will be provided after educational sessions to determine barriers preventing HPV vaccination. Furthermore, the outcome of the campaign will be determined by a comparison of vaccination rates before and after the campaign.

Translational Framework: Plan-Do-Act-Study

The Plan-Do-Act-Study (PDSA) model is a method used to test whether an intervention was effective. PDSA is one of the most utilized frameworks for QI projects (Christoff, 2018). The PDSA model is broken down into four components to evaluate an outcome, implement improvements, and reapply the intervention. The cycle of PDSA is used to create a plan, implement a test, observe the process, and determine aspects that need to be changed (AHRQ,2020). The PDSA model can be used as a method for continuous improvement within a QI project. The fundamental principles of the PDSA model help establish a basis for building on knowledge and providing improvement for an already established process (Christoff, 2018). The PDSA model will be used for the QI project involving the improvement of HPV vaccination rates at a public university.

Plan

This is a replication of a previous study that was conducted on the same population. The intervention was implemented on undergraduate students with the target population being aged 18-26 years of age. Stakeholders within SHS have identified that HPV vaccination rates are low among undergraduate students even though a QI was conducted to improve the rates. The previous study had difficulties with student engagement and the ability to provide education sessions due to the COVID-19 pandemic. The replication of the previous study will involve using a similar approach with additional features to determine if using different interventions will improve HPV vaccination rates. Additional interventions will include an in-person education session, education provided at university events, and a vaccination week hosted by SHS. Based on the literature review, providing a student-led HPV campaign can improve HPV awareness and vaccination rates. The student-led campaign will involve social media advertising, online/in-person educational seminars, an HPV vaccination clinic and HPV education at major events on campus.

Do

An integral part of implementation is observing the process and determining the impact of the intervention. The project will involve keeping track of the number of students that attend online/in-person sessions, surveying students to determine the impact of HPV education, and tracking the impact of social media advertising. Also, this step will involve collecting qualitative data through an anonymous optional survey through Qualtrics. These steps will involve monitoring problems and beneficial aspects of the interventions applied for this QI project.

Study

The QI project interventions will take place 10 days after the start of classes in Fall 2022. Once the online/in-person sessions, social media advertising, and educational awareness has been completed, data on HPV vaccination rates will be collected. The aggregate data collection will take place before and after the campaign occurred. The data will be analyzed to determine whether vaccination uptake increased and whether student surveys showed an increased willingness to take the vaccine. Voluntary survey data will be used to determine barriers preventing HPV vaccination. This information provides qualitative data to determine what type of barriers prevent vaccinations. HPV vaccination rates will determine whether students took the vaccine through SHS.

Act

The data collected will be used to determine the conclusions of the QI project. This replicated study will be compared to the previous study to determine if vaccination uptake is higher. Limitations and barriers will be identified based on the data collected from descriptive and qualitative data analysis. Feedback from stakeholders will also be collected to determine the impact of changes made in the replicated study. Future recommendations will be based on drawbacks and limitations determined by the QI project.

Population

Participants in the project will be undergraduate students, aged 18-26 years old, and currently enrolled at the university during the Fall of 2022.

Setting

The project will have several settings involved for intervention implementation. The settings will include online, at Student Health Services (SHS), and at other facilities on campus

where major events are taking place. The online sessions will occur on Zoom where participants can listen and view the presentation. An event at SHS will occur in a classroom with a maximum capacity of twenty-five participants. The events on campus will occur in the Student Union where information will be voluntarily shared with students.

Intervention

Online and In-Person Sessions

The sessions will take place during a 6-week period of the fall semester. The first session will involve an in-person education seminar at SHS, with an interactive PowerPoint presentation. Students will be provided with a light snack as an incentive for attending the in-person session. The next 5 educational sessions will be provided on an unrecorded Zoom with the same interactive platform. Students will not be required to turn on their cameras but will be encouraged to unmute themselves to answer and ask questions. The goal is to create an open dialogue during educational sessions to address health beliefs and awareness. The dialogue within the education session will not be recorded and patient identifiers will not be noted. The session will be conducted within 30 minutes and on a day that is deemed best by stakeholders. A two-question anonymous Qualtrics survey using open-ended questions will be provided for students to answer after the educational sessions to determine barriers preventing HPV vaccination and if the educational sessions impacted their willingness to receive the vaccine (See Appendix A). The survey is a de-identified, anonymous survey, that is voluntary for participants. *Social Media Advertisements*

Social media will be used to spread awareness of HPV and notify students of educational sessions that will be conducted. The SHS website will be used to publish a self-recorded video clip with educational information regarding HPV and HPV vaccinations. The number of video

viewers will be used for descriptive statistics. The nurse manager, medical director, student engagement staff, and IT staff will provide guidance on the video's structure and provide approval before publishing it on the SHS website. An advertisement containing information on the times and dates of educational sessions will be provided. These advertisements will be published on university-approved social platforms where the largest audience can be obtained. Based on the literature review, social media is a beneficial platform to bring awareness to college students (Gerend et al.,2019).

Health Education at Major Events

HPV education will be provided to students at university-sanctioned events where a larger audience can be achieved. During the event, educational pamphlets approved by stakeholders will be given to students and education will be provided to fill gaps in knowledge. The education provided to students during events will be used to provide awareness to students. The number of students that attended will not be collected and dialogue between students will not be recorded.

Data Collection

The data will be collected through IT services, surveys, and qualitative data during educational sessions. IT services will collect aggregate data of unvaccinated versus vaccinated students before and after interventions have been implemented. Data collected by IT services will be deidentified without any Protected Health Information (PHI) to avoid any Health Insurance Portability and Accountability Act (HIPPA) violations. Secondly, survey data will be collected through an approved Qualtrics platform to determine the impact of educational interventions. Lastly, qualitative data will be collected from determining themes that are present within de-identified, voluntary surveys after educational sessions. The survey data will be anonymous and de-identified from participants that provided information.

Data Measurement

The measurement of data will occur using descriptive statistics and qualitative data. The information collected by IT services will indicate the descriptive statistics changes pre-and post-intervention. Surveys collected after educational sessions will provide a description of students' ratings of HPV awareness. Dialogues conducted with students will help develop qualitative data and determine themes present within this population.

Data Analysis

Descriptive statistics were used as a measure to determine changes in vaccination status. The pre-and post-intervention improvement is determined by the vaccination status of students before and after the vaccination campaign. The number of students at university-sanctioned events and zoom sessions was not recorded. Qualitative data will be provided through the optional Qualtrics survey given to students after the zoom sessions.

Results

The results are provided using descriptive statistics with quantitative data. Eight students in total joined the zoom educational sessions that occurred for a 6-week period. HPV education was provided to students at the Student Union Center, a Health Fair through the School of Nursing, and a Sex Trivia education provided by the Student Government at the university. Participation in educational events and the YouTube educational video participants were not recorded. Moreover, the YouTube educational video was posted on Facebook for advertisement and the attendance of students at HPV education events were not recorded. Results indicated an increase in the number of students that received the HPV vaccination pre- to post-intervention (see Table 1).

Table 1

Pre and post-intervention HPV vaccines in both males and females aged 18-26

HPV vaccine dose	Pre-intervention	Post-intervention	Difference
1	235	703	468
2	378	2143	1765
3	1359	4182	2823

The pre-and post-intervention data show an increase in HPV vaccination uptake for vaccination doses 1-3. Table 1 shows the number of students vaccinated before the start of the HPV education sessions and after the HPV sessions. Each category shows an increase in the number of students vaccinated for doses 1-3. The last column lists the differences between the pre-intervention versus the post-intervention with an increase in the number of students vaccinated for each dose. The increase in vaccination uptake is an expected result of the HPV education campaign.

Qualitative Data

A voluntary, two-question, de-identified survey was offered to students after educational zoom sessions to determine barriers to HPV vaccination. The information provided by participants offered qualitative data to determine the reasoning behind HPV vaccination barriers. Four participants provided responses through Qualtrics. Participants stated barriers towards HPV vaccination include "lack of awareness", "lack of education", and "lack of support given by doctor". Lack of awareness was the major theme in the responses given by participants. Also, all participants said "yes" to the statement "I'm more likely to receive the HPV vaccination after this educational session".

Discussion

This QI project aimed to improve HPV vaccination rates among undergraduate students at a public university. HPV educational awareness contributed to the increase in HPV vaccination uptake among students. Health education was provided through online platforms and within campus facilities through the university. The information provided was sourced from the Centers for Disease Control (CDC) and approved by stakeholders at SHS. Descriptive data statistics were used to determine changes to vaccination uptake. The statistics showed an increase in vaccination uptake overall. The 1st HPV vaccination dose uptake presents as the most significant change because this signifies that the participant received the 1st dose during the 6week period of the campaign. The 2nd and 3rd doses show an increase in vaccination uptake, but it is difficult to determine if the patient initiated the series during the education campaign because of the vaccination schedule. The three-dose HPV vaccination is given at 0 months, 1-2 months, and 6 months. Therefore, students could have started the vaccine prior to the start of the vaccination campaign.

The PDSA model and HBM framework were used to guide the interventions used in this QI project. The education sessions were implemented to show aspects of the HBM. Education sessions allowed students to address perceived benefits, barriers, and susceptibility. The survey's given after education sessions addressed aspects of the HBM. Students did not indicate low perceived risk but did indicate a lack of awareness as one of the barriers to HPV vaccination. Also, the PDSA model enacted the aspects of replicating a previous project and indicated areas that required changes. The changes within the project included in-person education sessions and an HPV vaccination clinic. These interventions provided an increase in the number of students that were vaccinated post-intervention. During the duration of the project, in-person sessions

were added to increase the number of students that received HPV education. Therefore, this follows the "act" portion of the PDSA cycle where interventions were adopted to elicit change.

There were four university-sanctioned educational events where participants learned about HPV vaccination. The number of participants involved in education events was not counted for the OI projects results. Data collected for vaccination uptake could correlate with participants that were a part of educational events on campus. Unfortunately, the number of voluntary participants at the Student Union events was not accounted for in the data. Qualitative data provided insight into barriers to HPV vaccination, but the number of surveys collected was not statistically significant in determining if these participants agreed to become vaccinated. Hernandez et al. (2020) survey data indicated similar responses with themes related to lack of awareness and confusion. Responses from survey data did not reflect a low perceived risk of acquiring HPV although in other studies this was prevalent among college students (Albright et al., 2018; Christy et al., 2016; D'Errico et al., 2021; Grace-Leitch et al., 2016; Rose et al., 2018). Moreover, the pre-and post-intervention data were influenced by the entry of student information by the university. Stakeholders from IT services stated that at the time of the HPV campaign, immunization records were being inserted into campus records. Since this can have a significant influence on the numbers reported after the HPV campaign was finished, it is difficult to determine whether the HPV vaccination campaign purely influenced the increase in HPV vaccine doses. Gerend et al.(2019) & Kessler et al. (2021) used HPV education campaigns to increase HPV vaccination uptake on college campuses by 70%. These studies involved more widespread advertisements on campus and involving SHS providers in a reeducation program on HPV. The similarities to this QI project are related to bringing HPV education awareness to

college students. This QI project's quantitative results show a significant increase compared to previous studies.

Barriers

The HPV education campaign had aspects that posed multiple difficulties and setbacks. Advertisements were an integral part of gaining participants to become involved in the educational sessions. The setbacks were present when contacting staff at the university to determine how flyers about education sessions could be disbursed on university platforms. The campus website was used to determine which staff members to contact, this caused unsuccessful attempts at finding the appropriate person. Many staff members would not respond to emails or redirected the email to another person, this promotional aspect was delayed and decreased the amount of awareness brought to the project. For example, a promotional flyer was posted in a weekly newsletter, but it did not occur throughout the duration of the project because the main staff member initiating this left their position. This was detrimental because during this time advertisements were not occurring, and educational sessions were ongoing without any participants for many educational sessions. The lack of support regarding advertisement had a significant impact on the success of the project.

Conclusion

HPV awareness is an important aspect of reducing cancer rates and increasing vaccination uptake. Approximately 85% of sexually active individuals will get infected with HPV in their lifetime (CDC,2021b). Spreading awareness to college-aged students is important for decreasing future infections. HPV vaccination uptake increased during the health education campaign. Advertisement is an integral part of gaining participants in educational sessions.

Collaborative efforts among stakeholders can provide an effective approach to HPV education campaigns. HPV educational awareness has the potential to save lives and prevent cancer.

Relevance and Recommendations

The success of HPV vaccination among college-aged students will take a collaborative effort. Individuals that are aged 15-24 account for approximately 50% of new sexually transmitted diseases in the United States (CDC,2021a). The long-term risk of HPV infection should emphasize the importance of vaccination before possible exposure. Furthermore, a collaboration between stakeholders regarding HPV education within major universities can improve vaccination uptake. Replication of this project should involve early involvement in networking with communications and SHS staff to determine the best way to disburse advertisements. The foundation of this project relied on effective advertisements and would be executed more efficiently if staff members collaborate before the initiation of HPV education occurs. The project can be executed more productively if two students worked on this QI project. Universities/colleges may need to address protocols for HPV vaccination to determine if every opportunity to improve HPV awareness is seized. The undertaking of this project was immense for one individual to initiate, especially regarding advertisement, providing education, and investigating appropriate staff members at the university.

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Appendix A

What are some barriers preventing you from receiving the HPV vaccination? Please leave a comment in the box below. Examples Include:

- Lack of education/awareness
- Lack of support or advice given by your doctor
- Lack of parental support
- Personal decision due to low perceived risk
- Other

I'm more likely to receive the HPV vaccination after this educational session.

O Yes

O No