

Pediatric Human Papillomavirus Vaccination Rates Within a Tertiary Military Medical Center

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Abstract

Objective. To determine our center's human papillomavirus (HPV) vaccination rate and identify common negative perceptions surrounding the vaccine to guide more effective HPV vaccine counseling.

Methods. We reviewed immunization records for patients ages 11 to 26 that receive care at Brooke Army Medical Center. Vaccine uptake rate was determined by dividing the number of patients who had completed the HPV vaccine series by the total target population. From October 2021 to December 2022, a clinic survey was distributed to parents (for patients ages 11-17) or patients themselves (ages 18-26) during otolaryngology visits to poll vaccination status and attitudes toward the vaccine.

Results. A total of 3038 patients ages 11 to 26 are enrolled for primary care at Brooke Army Medical Center, but only 962 (32%) are vaccine complete. Thirty-five surveys were collected during the study period. Twenty-two surveys (63%) from patients/parents reported they/their child had received the HPV vaccine. Concerns about vaccine safety, sexual behaviors, lack of immunization requirement for school, and difficulty getting scheduled were the most common reasons patients were unvaccinated.

Discussion. Counseling patients on the HPV vaccine can be difficult given the common misconceptions surrounding vaccination, but understanding these attitudes will allow otolaryngologists to educate patients more effectively. This matters since patients more knowledgeable about HPV are more likely to receive the vaccine.

Implications for Practice. Our clinic has developed new strategies in partnership with primary care departments to facilitate more streamlined vaccination for eligible patients, and moving forward we plan to trend HPV vaccination rates over time to determine our impact on uptake.

Keywords

Gardasil, human papillomavirus, quality improvement, vaccination

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The human papillomavirus (HPV) is the most common sexually transmitted infection with an estimated prevalence of 43 million infections in the United States in 2018.¹ Viral infection is usually cleared by the immune system without patients ever experiencing signs or symptoms. But for some, HPV infection leads to potentially life-altering disease, including both benign and malignant processes.² Recurrent respiratory papillomatosis (RRP) and oropharyngeal squamous cell carcinoma (OPSCC) are otolaryngologic sequelae of HPV infection, both requiring varying degrees of surgical management and long-term follow-up. Fortunately, vaccination against HPV has been available since 2006, and while it was initially recommended for the prevention of genital warts or cervical/extragenital lesions and cancers in females ages 9 to 26, it has since become Food and Drug Administration approved for oropharyngeal and other head and neck diseases in June 2020.³ The HPV vaccine, known as Gardasil, was originally a quadrivalent vaccine which offered protection against 4 common viral types: HPVs 6, 11, 16, and 18. This was followed in 2014 by an expanded version of Gardasil, now a nonavalent vaccine available to females and males up to age 45 that offers coverage of the 4 original types plus additional high-risk types—31, 33, 45, 52, and 58.⁴

Vaccination has been proven >90% efficacious in the prevention of high-grade cervical, vulvar, and vaginal neoplasia.⁵⁻⁷ There have also been drastic declines in the incidence of juvenile-onset RRP in the United States and other countries, such as Australia, which authors suggest is most likely due to HPV vaccination.⁸ However, these

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advancements have occurred in a background of rising HPV-related oropharyngeal cancers. The incidence of all OPSCC in the United States has increased by over 60% from 1975 to 2012, a steep upward trend affecting predominantly white males. Globally, approximately 33% of all OPSCC is HPV-related, but in the United States, this estimate is much higher—nearly 71%. Not only does the incidence of HPV-related OPSCC now surpass that of cervical cancer, but it's shown a strikingly rapid increase in incidence comparatively among *all* types of cancers.^{9,10}

The relation between HPV vaccination and the prevention of OPSCC, while less extensively defined, has shown promising results thus far. In 2013, Herrero et al published a randomized clinical trial showing 93.3% reduction in the prevalence of oral HPV infection 4 years after participants received the bivalent vaccine.¹¹ Other authors have found that vaccination leads to the creation of neutralizing antibodies locally within the oral cavity, a mechanism thought to provide protection against oral HPV infection, which subsequently may prevent the development of OPSCC.¹²

Many countries have initiated HPV vaccination programs to foster widespread coverage. Australia, for example, has achieved 3-dose vaccine completion rates of 78% among girls and 67% among boys. Comparatively, the US falls short with only 65.5% and 48.6% of adolescents initiating and completing the vaccination series, respectively.^{8,13} Broadly, there is consensus within the literature regarding why vaccine rates are so low: lack of or missed opportunity for strong provider recommendation, lack of patient awareness/knowledge about HPV, and concerns about vaccine side effects or safety.^{2,5,9,13,14}

Several studies have been published in recent years that propose new strategies for increasing vaccine uptake, including more effective patient counseling and changes to clinical workflows.^{13,14} Similarly, we set out to perform a quality improvement (QI) project to determine our own institution's HPV vaccination rate, and to distribute a clinic survey to identify common negative perceptions within our community about the vaccine to guide more effective counseling.

Methods

We obtained an exemption from the Brooke Army Medical Center Institutional Review Board in the form of a Non-Research Determination. Deidentified patient immunization records were compiled from the Military Health System Population Health Portal, which is housed within a central patient information site titled CarePoint. All patients ages 11 to 26 and currently enrolled for primary care at Brooke Army Medical Center, or its satellite facilities, were saved to a master list. Specific filters were applied to this list to identify those patients who have received 1, 2, or 3 doses of the HPV vaccine. This data was exported to an Excel spreadsheet for ease of

organization and calculating vaccination percentages by age group and number of doses received. Patients were considered vaccine complete after 3 doses except ages 11 to 14, who were considered complete with 2 doses after October 2016.

We also developed a survey to poll demographic information, vaccination status, and positive or negative attitudes toward the HPV vaccine. From October 2021 to December 2022, this survey was distributed to patients 11 to 26 years old attending an outpatient otolaryngology appointment. Upon check-in to our clinic, parents accompanying children ages 11 to 17 were given a “parental HPV survey” (**Figure 1**) to complete on their child's behalf, while patients ages 18 to 26 were given an “adolescent HPV survey” (**Figure 2**) to complete themselves. These surveys were reviewed at the end of the clinic encounter.

Parents or adolescents who selected “No” or “I don't know” for their child's/their own vaccination status were offered brief counseling to review the indications and benefits of the vaccine, including review of a Centers for Disease Control HPV vaccine information print out. This was followed by a strong recommendation from the physician for the patient to begin HPV vaccination. For those patients who had initiated the HPV vaccine series but were not yet complete, it was strongly recommended that they obtain their second and/or third doses. For those surveys that were returned incomplete, the parent/adolescent was asked to complete it. If they declined, then the survey was saved but denoted as incomplete. Frequency and percentages were calculated for categorical variables.

Survey responses were recorded in an Excel spreadsheet. Department of Defense Identification numbers (DOD IDs), which are 10-digit medical record identifiers, were collected within the demographic data to ensure responses were not duplicated as surveys were being transcribed into our spreadsheet. Prior to completing the survey, patients were counseled that their DOD IDs would not be saved.

Results

A total of 3038 patients aged 11 to 26 are enrolled for primary care at Brooke Army Medical Center. Most of these patients are 11 or 12 years old (20.5% and 19.9%, respectively). Of the entire cohort, 1491 patients (49.1%) have initiated the HPV vaccination series and 962 (31.7%) have completed their doses. Overall, patients aged 11 to 15 composed over 80% of the cohort studied. The initiation rate among these ages ranged from 45.3% to 50.4%, while the completion rate was 25.3% to 32.3%. The 18-year-old age group had the highest vaccine initiation and completion rates (61.5% and 46.2%, respectively), though there were only thirteen 18-year-olds enrolled at the time of this study.

We collected a total of 35 surveys. Twenty-three were completed in their entirety, while the other 12 were considered incomplete. Twenty-three surveys were

Child FMP/DOD ID _____ Child Age _____ Today's Date _____

- Please circle your age: 20-29 30-39 40-49 50-59 ≥60
- Please circle your relationship to the child: Mother Father Grandmother Grandfather Guardian
Other: _____
- Please circle your primary race: White Black or African American Asian American Indian/Alaskan Native
Native Hawaiian/Pacific Islander Other: _____
- Please circle your ethnicity: Hispanic Not Hispanic
- Please check the highest grade in school that you have completed
 - Less than high school
 - Some high school Completed high school
 - Some college Completed college
 - Some graduate studies Completed graduate studies
- Have you (the parent/guardian) received the HPV vaccine? Yes No I don't know
 - If so, how many doses? One Two Three I don't know
- Has your child received the HPV vaccine? Yes No I don't know
 - If so, how many doses? One Two Three I don't know
 - If so, which of the following was the **most** important reason for having your child receive the vaccine?
 - Prevention of warts and/or cancer
 - Recommendation from a doctor
 - Recommendation from a friend/family member
 - Required immunization for school enrollment
 - Other: _____
- Which of the following conditions *have you been told* can be reduced or prevented by receiving the HPV vaccine? Please check all that apply
 - Cervical warts
 - Cervical cancer
 - Anal warts
 - Anal cancer
 - Recurrent respiratory papillomatosis (mouth/throat/airway warts)
 - Mouth/throat/airway cancer
 - None of the above (I have not been told anything about the HPV vaccine)

*****If your child has **not** received the vaccine, please continue below*****

- Has your child seen their pediatrician at least once within the past two years? Yes No
- Has your child's pediatrician ever recommended the HPV vaccine? Yes No
- If it has been recommended but not given, which of the following are reasons for not receiving it? Please check all that apply. If multiple reasons are checked, please circle the **most** important reason to you.
 - Concern about the safety of the vaccine
 - Concern about the cost of the vaccine
 - Concern that the vaccine is not effective
 - Concern that the vaccine is not necessary for my child because of their gender
 - Concern about increasing my child's sexual activity
 - Concern that the vaccine is not necessary for my child because their risk for exposure to warts/cancer is low
 - It is not a required immunization for school enrollment
 - It is difficult to schedule getting the vaccine
- The HPV vaccine can prevent mouth/throat/airway warts and cancer. Does knowing this make you more likely to have your child receive the vaccine? Yes No
- Compared to prior to this appointment, are you more or less likely to have your child receive the HPV vaccine?

Much less likely Less likely No difference More likely Much more likely

Figure 1. Parental HPV survey. DOD ID, Department of Defense Identification number; FMP, family member prefix; HPV, human papillomavirus.

completed by parents and 12 surveys were completed by patients ages 18 to 26. Twenty-two surveys (62.9%) reported prior vaccination—4 patients had already received 3 doses, 6 patients had received 2 doses, 0 patients had received 1 dose, 11 patients were unsure of the number of doses received, and 1 patient did not answer how many doses they had received. The most common reasons noted for having received vaccination were for the prevention of cervical warts/cancer and having a recommendation from a doctor.

Ten surveys (28.6%) denied prior vaccination. Most of these surveys were returned incomplete, with only 4 survey respondents answering the potential reasons for not being vaccinated. Of the choices, concerns regarding

vaccine safety, increased sexual activity, the vaccine not being required for school enrollment, and difficulty in getting scheduled were each listed as reasons why the vaccine had not been received. Of these 10 surveys, 4 respondents stated they were “much more likely” to receive the vaccine, 2 were “much less likely,” and 4 felt “no difference” about vaccination after the counseling and information sheet they received. The 3 remaining surveys (8.6%) were unsure of their vaccination status.

Twenty-two respondents (62.9%) noted prior knowledge of diseases reduced or prevented by the HPV vaccine—9 respondents were aware that it prevents cervical disease, 3 respondents were aware of head and neck diseases, and 10 were aware of both. Most of these respondents were

Patient DOD ID _____ Patient Age _____ Today's Date _____

- Please circle your gender: Male Female Transgender Male Transgender Female Gender fluid/non-binary
Other: _____
- Please circle your primary race: White Black or African American Asian American Indian/Alaskan Native
Native Hawaiian/Pacific Islander Other: _____
- Please circle your ethnicity: Hispanic Not Hispanic
- Please check the highest grade in school that you have completed
 - Less than high school
 - Some high school Completed high school
 - Some college Completed college
 - Some graduate studies Completed graduate studies
- Have you received the HPV vaccine? Yes No I don't know
 - If so, how many doses? One Two Three I don't know
 - If so, which of the following was the **most** important reason for receiving the vaccine?
 - Prevention of warts and/or cancer
 - Recommendation from a doctor
 - Recommendation from a friend/family member
 - Required immunization for school enrollment
 - I do not know or remember the reason I received the vaccine
 - Other: _____
- Which of the following conditions *have you been told* can be reduced or prevented by receiving the HPV vaccine? Please check all that apply
 - Cervical warts Cervical cancer
 - Anal warts Anal cancer
 - Recurrent respiratory papillomatosis (mouth/throat/airway warts)
 - Mouth/throat/airway cancer
 - None of the above (I have not been told anything about the HPV vaccine)

*****If you have **not** received the vaccine, please continue below*****

- Have you seen your primary care provider at least once within the past two years? Yes No
- Has your primary care provider ever recommended the HPV vaccine? Yes No
- If it has been recommended but not given, which of the following are reasons for not receiving it? Please check all that apply. If multiple reasons are checked, please circle the **most** important reason to you.
 - Concern about the safety of the vaccine
 - Concern about the cost of the vaccine
 - Concern that the vaccine is not effective
 - Concern that the vaccine is not necessary for my child because of their gender
 - Concern about increasing my child's sexual activity
 - Concern that the vaccine is not necessary for my child because their risk for exposure to warts/cancer is low
 - It is not a required immunization for school enrollment
 - It is difficult to schedule getting the vaccine
- The HPV vaccine can prevent mouth/throat/airway warts and cancer. Does knowing this make you more likely to have receive the vaccine? Yes No
- Compared to prior to this appointment, are you more or less likely to receive the HPV vaccine?

Much less likely Less likely No difference More likely Much more likely

Figure 2. Adolescent HPV survey. HPV, human papillomavirus; DOD ID, Department of Defense Identification number.

vaccinated. Thirteen patients (37.1%) had no prior knowledge of diseases reduced by the HPV vaccine or left this item unanswered, and most were unvaccinated. No trends in any survey responses were appreciated when separated based on patient/parent age, gender, race, ethnicity, or the highest education level.

Discussion

HPV is a ubiquitous pathogen and the most common sexually transmitted infection. This virus is of particular interest within otolaryngology as it leads to an array of chronic head & neck diseases, including RRP and squamous cell carcinomas. While vaccination for HPV is readily available in the United States, uptake rates

remain low (<50% vaccine completion among adolescents) for many reasons: missed opportunities for provider recommendation for vaccination, lack of patient knowledge, and safety concerns.^{2,5,9,13,14} These low uptake rates are concerning in the setting of an increasing incidence in HPV-related OPSCC in the United States, and especially since vaccination has been shown to decrease the prevalence of oral HPV infection.^{7,10-12} This concern is shared across current literature, with some studies sharing their own QI successes and advocating for continued improvements.

Bonville et al effectively implemented a multiphase QI project with 2 goals: reduce missed opportunities for vaccine recommendation and increase vaccine uptake. They began with a pilot program wherein providers were given formal

education on QI, HPV infection, and the HPV vaccine. Afterward, providers successfully implemented new strategies within their practices (such as reviewing immunization records prior to clinic visits, delivering strong vaccine recommendations, and placing standing orders for vaccination), which resulted in 0 missed opportunities and an increase in vaccine uptake by 32% after just 5 months.¹³

Berenson et al also had an effective approach to addressing low vaccine uptake. In their study, designated “on-site patient navigators” identified patients eligible for vaccination prior to their appointments, counseled parents/patients about the HPV vaccine, and notified providers of those parents/patients who requested further counseling. These navigators went on to facilitate same-day or future appointments for vaccination for patients *and* their siblings (if also eligible) and tracked follow-up visits to ensure patients received their second or third doses. Of participants initiating the vaccine series through this study, 93% completed all doses, and 85% who started their series elsewhere also completed their doses through this study.¹⁴ While these studies show promising results within the primary care setting, there remains an untapped role for the otolaryngologist to more routinely counsel on HPV vaccination. For this reason, we sought to establish our institution's HPV vaccination rate and developed a survey through which we could determine how best to counsel patients about the HPV vaccine in our community.

Just over 49% of all patient ages 11 to 26 who are enrolled for primary care at Brooke Army Medical Center have initiated HPV vaccination, and 32% have completed the series. These numbers were surprising to us since both are lower than the national averages, and additionally, highlights the importance of our study. Ten respondents denied prior receipt of the HPV vaccine. Additionally, 3 were unsure of their vaccination status, which we interpreted as a more likely indicator the vaccine had not been received. Reasons for not having received the HPV vaccine included concerns over vaccine safety, potential increases in sexual activity, the lack of immunization requirement for school, and difficulty in being scheduled for vaccination. Except for school policy, these are factors we believe can be addressed with proper counseling.

HPV vaccine safety has been proven during previous trials.⁷ While pain at the injection site (most common), headache, fever, pharyngitis, or other minor adverse events have been reported, Restrepo et al just published long-term follow-up results for Phase III Gardasil-9 recipients and found lasting efficacy 10 years after vaccination in the absence of any serious adverse events.¹⁵ Concerns regarding sexual activity have been investigated as well, including potential vaccine influences on sexual debut and number of sexual partners, but ultimately no significant differences were found in relation to the HPV vaccine.^{16,17} This information is critical, and taken together, clarifies concerns that could lead to more open dialogue about HPV vaccination between otolaryngologists and patients.

Some patients reported a “much less likely” chance of receiving the vaccination despite counseling and a strong recommendation, and so we recognize there may always be a proportion of patients who cannot be convinced to receive the vaccine. Reasons for this are hard to speculate and probably multivariate. Bloom et al recently published a study in which they found patients more knowledgeable about HPV are more likely to accept vaccination.¹⁸ This proved true in our findings as well, as most vaccinated participants reported prior knowledge of HPV-related diseases. Furthermore, unvaccinated participants who also had prior knowledge of HPV reported they were “more likely” or “much more likely” to receive vaccination.

Patient or parent buy-in is key, but we have also learned that equal effort should be made to ensure processes for receiving the vaccine are straightforward and easy. Some respondents might have already been vaccinated if not for difficulty in scheduling an appointment. Moving forward, our clinic has engaged in partnership with pediatric and other primary care departments to facilitate same-day vaccination, or at least same-day scheduling. This could be enhanced by replicating some of the successful strategies as mentioned in the QI projects above, such as identifying unvaccinated patients ahead of time, placing standing orders, or designating staff to assist with scheduling.

One limitation of our study is the variability/incompleteness of several surveys returned to us. Another limitation is our small sample size. Survey attainment proved difficult as there were persistent fluxes in our front-desk staff that led to missed opportunities to provide surveys to patients. In addition, while our survey was reviewed by all participating otolaryngology staff, it was not formally validated. We believe these factors are less problematic when engaging in QI work, as this is an on-going and iterative process situated within our local context. Certainly, our findings would be better supported by a larger quantity of surveys, but we still obtained actionable information in accordance with our original objectives.

Implications for Practice

HPV vaccination is critical for the prevention of head and neck diseases, including RRP and OPSCC. Vaccine counseling and promotion can be difficult given the common misconceptions or disinterest surrounding vaccination. We utilized a patient survey to identify the most common concerns regarding HPV vaccination, which will allow for more effective conversations with our patients moving forward. In addition, we are implementing new clinical strategies to facilitate more streamlined vaccination scheduling so that patients willing to receive the vaccine may do so conveniently. Future research will focus on follow-up with vaccine-eligible patients seen in our otolaryngology clinic to see if they have received vaccination, and thereby, determine our impact on vaccine uptake.

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Author Contributions


Candace A. Flagg, substantial contributions to the conception or design of the work, acquisition, analysis, and interpretation of data for the work, drafting the work and revising it critically for important intellectual content, final approval of the version to be published, agreement to be accountable for all aspects of the work; **Benjamin K. Walters**, substantial contributions to the conception or design of the work, acquisition, analysis, and interpretation of data for the work, final approval of the version to be published, agreement to be accountable for all aspects of the work; **Sarah N. Bowe**, substantial contributions to the conception or design of the work, acquisition, analysis, and interpretation of data for the work, drafting the work and revising it critically for important intellectual content, final approval of the version to be published, agreement to be accountable for all aspects of the work.

Disclosures

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