



## REVIEW ARTICLE

# Improving HPV Vaccination Rates in a Pediatric Group: A Pilot Project

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**ABSTRACT**

**Background:** Human Papilloma Virus (HPV) vaccines are safe and effective and provide long-lasting protection against the virus. The Centers for Disease Control and Prevention (CDC) recommends routine HPV vaccination at 11-12 years old, although the series can be started at age 9 years. However, the American Academy of Pediatrics (AAP) and the American Cancer Society (ACS) recommend routinely starting the HPV vaccination series at age 9 years.

**Aims:** The purpose of this quality improvement project was to improve HPV vaccination rates by 10% in patients ages 9-10 years at a large pediatric group in Salt Lake City, Utah. This purpose was accomplished through pediatric healthcare provider (HCP) education.

**Methods:** A questionnaire was used to determine the HCPs' clinical practice and confidence level regarding the HPV vaccine at baseline before the educational presentation. The vaccination education was based on HPV resources from the AAP and ACS and focused on the rationale for initiating the HPV vaccine series at ages 9-10 years. The goal was to increase HPV vaccinations in 9-10-year-olds by 10%.

**Results:** Prior to HCP education, HCPs were somewhat confident initiating the HPV vaccine series at age 9-10 years old. HCPs reported that parents questioned the need for HPV vaccine at age 9-10 years because it is earlier than the age of typical sexual activity. Because the clinic had not yet adopted the AAP and ACS recommendation to routinely administer HPV vaccination at age 9-10 years, individual HCPs were more likely to follow the recommendations of the CDC. One year after presenting the HCP education, HPV vaccination rates increased by 149 (61%) doses among 9-10-year-old patients.

**Discussion:** HCPs' confidence levels in HPV vaccination increase as the child ages. However, there are multiple benefits to initiating HPV vaccination at the age of 9 years, including timely completion, prevention of more cancers, and improved immunogenicity. HCP education is an effective strategy to increase HPV vaccination in 9-10-year-old patients.

## Introduction

### IMPROVING HPV VACCINATION RATES IN A PEDIATRIC GROUP: A PILOT PROJECT

Human Papillomavirus (HPV) is the most common sexually transmitted infection in the United States (US)<sup>1</sup>. Approximately 85% of those who are sexually active will contract HPV at some point in their lifetime<sup>2</sup>. HPV causes genital warts, as well as cervical, vaginal, vulvar, penile, anal, and oropharyngeal cancers<sup>3</sup>. There are over 200 different strains of HPV, but most HPV-related cancers are caused by HPV 16 and HPV 18<sup>4</sup>.

HPV vaccines are both safe and effective, providing long-lasting protection<sup>5</sup>. Over 135 million doses of HPV vaccine have been administered since the introduction of the first quadrivalent vaccine in 2006<sup>6,7</sup>. Since 2016, Gardasil 9 has been the only HPV vaccine available in the US, which now protects against nine different strains of HPV virus<sup>8</sup>. Currently, the CDC routinely recommends initiation of HPV vaccination at 11-12 years of age, although the HPV vaccine series may be started as early as 9 years of age<sup>9</sup>. However, the American Academy of Pediatrics (AAP)<sup>10</sup> and the American Cancer Society (ACS)<sup>11</sup> have taken a stronger stance, recommending routine HPV vaccination at age 9 years.

HPV vaccine uptake remains low even with ample proof of its efficacy and safety. Because the HPV vaccine can effectively prevent HPV-caused cancers, vaccine uptake should ideally be 100%. However, the national average for completion of the HPV series remains low at ~58%<sup>12</sup>. In Utah, where this quality improvement project took place, 61.4% of adolescents are up-to-date on their HPV vaccinations<sup>13</sup>. While HPV vaccination rates have improved somewhat over the last decade, barriers to timely HPV vaccination still exist, most notably a lack of healthcare providers' (HCPs) knowledge on when to start the series and a lack of a strong HCP endorsement<sup>14</sup>. Additional barriers to timely HPV vaccination commonly include concerns about vaccine safety, efficacy, and cost<sup>15</sup>, as well as a general distrust of pharmaceutical companies, the government, and healthcare systems<sup>16</sup>.

Healthcare providers have a pivotal role in improving HPV vaccination rates. In their day-to-day interactions with children and parents, HCPs can effectively guide discussions about the HPV vaccine while simultaneously reinforcing the importance of preventing certain types of cancer with the vaccine, and dispelling vaccine misinformation<sup>17,18</sup>. In fact, a strong recommendation from the HCP effectively improves HPV vaccine uptake<sup>18</sup>.

### SPECIFIC AIMS

The purpose of this quality improvement (QI) project was to improve HPV vaccination rates by 10% in patients ages 9-10 years at a large pediatric group in Salt Lake City, Utah. A 10% improvement was selected by the clinics because that modest improvement seemed realistic and attainable. The team focused on 9–10-year-old children because those are the ages the AAP and ACS recommend when initiating the HPV vaccine series. This purpose was accomplished through pediatric HCP education.

### AVAILABLE KNOWLEDGE/REVIEW OF LITERATURE

HPV is an infection that can lead to several different cancers, including cervical, oropharyngeal, and penile cancers, although the cancer takes years to develop<sup>19</sup>. Approximately 46,000 new cases of HPV-related cancers are diagnosed each year in the US<sup>20</sup>. Of these new cases of HPV-related cancer, about 25,000 occur in women, while approximately 21,000 are diagnosed in men<sup>20</sup>. Worldwide, HPV infection causes cancer in about 625,000 women and 69,000 men every year<sup>21</sup>.

While up to 90% of HPV infections will spontaneously resolve within 2 years<sup>22</sup>, patients who remain infected may have contracted one of the highly oncogenic HPV types, namely HPV 16 and 18<sup>4</sup>. HPV 16 and 18 are more likely to cause both cancer and death<sup>23</sup>. The most common cause of HPV-related death in women is cervical cancer, with 4,000 deaths every year in the US<sup>19</sup>. For men, the most common cause of HPV-related death is cancer of the oropharynx<sup>24</sup>.

The Gardasil 9 vaccine provides remarkable protection against HPV 16 and 18, as well as seven other types of HPV infection<sup>25</sup>. In fact, Gardasil 9 is one of the most effective vaccines in the US<sup>26</sup>. Since the introduction of the HPV vaccine, anogenital warts have decreased by 83% and precancerous lesions of the cervix have decreased by 51% in women 15-19 years old<sup>27</sup>. Research has shown more than 98% of recipients of the HPV vaccine develop an antibody response<sup>28</sup>; additionally, this response remains protective against HPV infections for at least 10 years following vaccination<sup>29</sup>.

Over 29 million doses of Gardasil 9 have been administered in the US with no key safety concerns<sup>26</sup>. The most common side effects of Gardasil 9 mimic those of other vaccines, including pain at the injection site, headache, fever, nausea, and muscle or joint pain<sup>30</sup>. Unique to the Gardasil 9 vaccine, syncopal episodes have also been reported during vaccination, although rare<sup>30</sup>. To mitigate injuries secondary to syncope, it is recommended the patient remain seated and observed for 15 minutes following the Gardasil 9 vaccination<sup>31</sup>.

Since the addition of the HPV vaccine to the recommended schedule, primary care clinics have been searching for ways to improve HPV vaccination coverage among their patients. Technologic interventions, such as embedding an HCP reminder for HPV vaccine-eligible patients have been one successful tool<sup>32</sup>. Other successful interventions included the initiation of parent reminders, clinic-level audits, and workflow modifications<sup>33</sup>. Additionally, a systematic review of 40 peer-reviewed articles demonstrated a marked improvement in HPV vaccination rates with HCP education<sup>34</sup>.

An HCP's knowledge regarding the HPV vaccine influences their comfort level with administering the vaccine, which may then negatively affect the strength of the HCP recommendation for vaccination<sup>35</sup>. In one study of adolescent HCPs in five countries, about 74% of HCPs reported they were comfortable recommending HPV vaccination, although, in one country, South Korea, only 33% of HCPs were comfortable recommending HPV vaccination<sup>36</sup>. Another study of pediatric HCPs and family

practice HCPs over a 10-year time span revealed an increase in the number of HCPs who strongly recommended the HPV vaccine for younger patients<sup>37</sup>. Between 2008 and 2018 the proportion of HCPs who strongly recommended HPV vaccine increased from 53% to 79% for female patients and from 48% to 76% for male patients<sup>37</sup>. While the number of HCPs who are comfortable and confident in making a strong HPV vaccine recommendation is rising, it is still below the Healthy People 2030 goal of 80% for males and females<sup>38</sup>. Moreover, HCPs tend to give a weaker recommendation for younger children to receive the HPV vaccine<sup>39</sup>. Nevertheless, a strong recommendation from the HCP is the most important factor influencing HPV vaccine acceptance<sup>40</sup>.

## Methods

### CONTEXT

This pilot project aimed to improve HPV vaccination rates in patients ages 9-10 years at a large pediatric group in Salt Lake City, Utah, by providing HCP education. The providers that attended the educational presentation all worked directly in pediatrics. In total, the experience of the HCPs ranged from 1 year to 23 years. The project was conducted in collaboration with a large pediatric group in Salt Lake City, Utah, which included three separate clinic sites. All HCPs were invited to attend the education presentation.

### INTERVENTION

A questionnaire was used to determine the HCPs' clinical practice and confidence level regarding the HPV vaccine at baseline before the educational presentation. The questionnaire included six questions. The first question was demographic, asking the participant to report on their state license to practice: Medical Doctor, Doctor of Osteopathy, Nurse Practitioner, Physician Assistant, or Registered Nurse. The remaining five questions included one multiple-choice, three Likert-type, and one open-ended question. The multiple-choice question assessed the HCPs' clinical practices by asking at what age they routinely recommended the initial HPV vaccine. The three Likert-type questions assessed the HCPs' confidence level initiating the HPV vaccine series when patients were 9-10 years old, 11-12 years old, and at age 13 years or older. The Likert-type scale included a 1-10 range with one indicating hesitancy and 10 representing confidence. The final open-ended question asked the HCPs to list factors specifically influencing their confidence in vaccinating 9-10-year-old patients with the HPV vaccine.

An HPV vaccination education was developed for HCPs currently employed by the pediatric group. The education was designed by a team of vaccination experts in collaboration with one of the Nurse Practitioners at the clinic and the pediatric group's education coordinator. Content for the education was based on evidence-based HPV resources from the ACS and the AAP (2023). The educational presentation included the rationale for initiating the HPV vaccine series at age 9-10 years rather than delaying the vaccine until the child was older. Such rationale included information regarding the enhanced immune response when vaccinating earlier, the increased likelihood of completing the vaccination series prior to first exposure,

the decreased number of vaccinations needed to complete the series, and parental receptiveness. The education presentation was delivered to the HCPs in mid-April.

In the weeks following the educational presentation, the HCPs continued discussions regarding the decision to initiate the HPV vaccine series starting in the younger 9-10-year-old age group. The project leaders and clinic HCPs set a goal of increasing the number of HPV vaccinations in their 9-10-year-old patient population by 10% by the end of the year 2023.

### ANALYSIS

The results of the questionnaire were analyzed using descriptive statistics. Achievement of the goal to increase the number of HPV vaccinations in the 9-10-year-old patient population by 10% was measured by comparing HPV vaccination rates in 9-10-year-old patients from 4<sup>th</sup> quarter 2022 (pre-education) to 4<sup>th</sup> quarter 2023 (post-education). The results were then reported to the Nurse Practitioner collaborator in the pediatric group.

### ETHICAL CONSIDERATIONS

Because the intervention was a quality improvement project, it was deemed exempt by the Institutional Review Board.

## Results

### DEMOGRAPHICS

Fourteen HCPs participated in the educational presentation and completed the pre-education questionnaire. There were six physicians, two nurse practitioners, and six registered nurses. No other demographic data were collected. When questioned about what age they routinely recommended the initial HPV vaccination, approximately 43% (n = 6) of participants stated "9 years of age." Additionally, 7% (n = 1) stated "10 years of age," while approximately 43% (n = 6) stated "11 years of age." The remaining 7% (n = 1) of participants stated "12 years of age." No HCPs selected "13 years of age or older."

### CONFIDENCE IN HPV VACCINE

Three questions focused on HCP confidence in recommending the HPV vaccine based on age groups: 9-10-year-olds, 11-12-year-olds, and 13-year-olds and older. Confidence was measured on a 1-10 Likert-type scale with anchors of "1 – Hesitant" and "10 – I am confident." Participant confidence regarding vaccination of 9-10-year-old patients against HPV was a mean of 6.43 (SD = 3.13). Participant confidence regarding HPV vaccination for 11-12-year-old patients was a mean of 9.57 (SD = 1.29). Participant confidence for HPV vaccination for 13-year-olds and older was a mean of 9.79 (SD = 0.77).

### INFLUENCING FACTORS

The final question was open-ended asking "What influences your confidence in initiating the HPV series in 9-10-year-old patients?" There were 12 responses. Themes from responses that influence HCPs to delay HPV vaccination until the child is older included *parental hesitations*. For example, some HCPs reported the likelihood of sexual contact was less likely when the child

was young and, therefore, parents hesitated to vaccinate with HPV until their child was more likely to be sexually active. This theme was captured in HCP comments such as, “Sometimes parents are less likely to do it at younger ages due to not sexually active,” and “young age, side effects, so much earlier than typical sexual debut (and parents are typically more hesitant because of this).” However, HCPs also reported on what positively influenced them to initiate HPV vaccinations at age 9-10 years. The theme that emerged was that of *clinic expectations*, albeit the HCPs also acknowledged the need for time to fully adopt the new age guidelines for HPV vaccine. For example, HCPs who initiated HPV vaccinations at age 9-10 years reported the following reasons for increased confidence: “The providers that I have worked with for 7 years [focus on] HPV vaccine,”

and “[We are] just getting more used to it as a clinic.”

**PROJECT GOAL**

The goal of this project was to increase the number of HPV vaccines in the 9-10-year-old age group by 10% in 1 year. To evaluate whether the goal was achieved, the number of HPV vaccines administered during the 4<sup>th</sup> quarter of 2022 was compared to the number of HPV vaccines administered during the 4<sup>th</sup> quarter of 2023. The number of HPV vaccines delivered to 9-10-year-old patients increased by 149 (61%) doses in 1 year. The total HPV vaccination, including all doses and among all patients, increased by 811 or by 24.5% in 1 year. Thus, the project goal was achieved. See Table 1 for year-to-year comparisons by age group.

**Table 1:** Comparisons by Age Group

Age Group	2022	2023	Total Change	Percent Change
9–10-year-olds	244	393	149	61%
11–12-year-olds	1403	2019	616	43.91%
13 + year olds	1667	1713	46	2.76%

**Discussion**

The Advisory Committee on Immunization Practices has recommended routine HPV vaccination at age 11-12 years for females since 2006 and males since 2011<sup>41</sup>. However, the CDC<sup>42</sup> also states the HPV vaccine series can start at age 9 years. At least 22 different articles were published between 2022-2023 demonstrating the benefits of beginning the HPV series at age 9 years<sup>43</sup>. Consequently, the AAP<sup>10</sup>, ACS<sup>11</sup>, the National HPV Vaccination Roundtable<sup>44</sup>, and World Health Organization<sup>45</sup> updated their HPV vaccination guidelines, recommending routine vaccination at age 9 years. There are multiple benefits to initiating HPV vaccination at the age of 9 years. For example, starting the HPV vaccine series at age 9 may lead to more timely completion<sup>46</sup>, which then prevents more cancers<sup>44</sup>. Additionally, HPV vaccination at age 9 results in improved immunogenicity<sup>47</sup>. Vaccinating at age 9 also increases the likelihood of achieving protection against HPV before the patient is exposed to the virus<sup>48</sup>. Notably, when vaccinating for HPV at 9 years of age, HCPs reported fewer discussions with parents about sexual activity<sup>49</sup>.

HCP-focused education on HPV vaccine can improve vaccination rates<sup>50</sup>, especially among 9-10-year old patients<sup>51</sup>. When trusted HCPs confidently provide a high-quality HPV vaccine recommendation, they can also positively influence parents’ vaccination decisions<sup>52</sup>. In this pilot project, HCPs at three different pediatric clinics received one educational presentation regarding the importance of HPV vaccine and the AAP and ACS guidelines to initiate HPV vaccine at 9-10 years old. The goal was to increase the number of initial HPV vaccinations in the 9–10-year-old population by 10% within 1 year; a goal which was successfully met. Other HCP-focused education projects have also successfully increased HPV vaccination rates. For example, an HPV learning collaborative among 47 clinical practices over 9 months improved HPV vaccination in female and male adolescent patients by 8%<sup>53</sup>. Similarly, HCP education

regarding HPV vaccination at a large Nashville practice doubled HPV vaccination rates in Internal Medicine and Family Practice and increased HPV vaccination rates in Pediatrics from 137 to 241 delivered doses<sup>54</sup>.

Generally speaking, HPV vaccination rates are higher among the 13-17-year-old age group when compared to the 9-12-year-old age group<sup>50,55</sup>. There are parental barriers to HPV vaccination of younger, 9- to 10-year-old children, including concern regarding potential adverse side effects, misinformation or lack of information, and distrust in medical advances<sup>56</sup>. However, our Utah-based project is the only one we know of where HCPs’ confidence levels in vaccinating children for HPV were measured based on the child’s age. Pre-education, we found that HCP confidence regarding HPV vaccination increased with the child’s age. HPV vaccine confidence increased from 6.43 (on a 1-10 Likert-type scale) for 9-10-year-olds to 9.57 for 11-12-year-old patients and to 9.79 for 13-year-olds and older. Thus, it is important to focus on improving, not only parental confidence in the HPV vaccine but also the confidence levels of HCPs vaccinating 9-10-year-olds against HPV.

**Recommendations**

HCP education regarding the HPV vaccine is an effective strategy to increase HPV vaccination rates of 9-10-year-old patients. However, finding time among HCPs can be challenging. To overcome this challenge, offering education over the lunch break while providing lunch may be helpful. It is also important to have an HPV vaccine champion at each clinic location, who is a trusted expert in the HPV vaccine and up-to-date on the shift to vaccinate children starting at age 9. Various evidence-based toolkits are available for HCPs, free of charge, to improve HPV vaccination rates from the CDC (<https://www.cdc.gov/hpv/partners/index.html>), National HPV Vaccination Roundtable ([http://hpvroundtable.org/wp-content/uploads/2023/05/FINAL\\_NW-Summit-Clinic-Toolkit-Print-On-Demand-Kits.pdf](http://hpvroundtable.org/wp-content/uploads/2023/05/FINAL_NW-Summit-Clinic-Toolkit-Print-On-Demand-Kits.pdf)), and AAP

(<https://www.aap.org/en/news-room/campaigns-and-toolkits/human-papillomavirus-hpv/>).

## Limitations

Like all projects, this study has limitations. While our project was successful, it was conducted with a small population of HCPs and only 50% of the eligible HCPs attended the educational session. Also, we collected baseline data with a pre-education questionnaire, but did not measure changes in perception post-education. The project was only piloted in one pediatric group in Salt Lake City, Utah, that had three separate clinic locations. Therefore, the success of this project may not be reproducible in other pediatric clinics.

## Conclusion

HPV is a common sexually transmitted infection that causes genital warts and cancer. The HPV vaccine is safe and highly effective at preventing HPV infection and

while several organizations recommend starting the vaccine series at age 9, the highest vaccination rates are in the 13-17-year-old age group. This QI project aimed to increase HPV vaccination rates in 9-10-year-old patients by 10% in 1 year in a Salt Lake City, Utah pediatric group. The aim was achieved and exceeded with one HCP educational session. Topics of education were evidence-based and freely available online from the ACS and AAP. Educating HCPs and increasing confidence in the HPV vaccine dramatically transforms HPV vaccine uptake and the prevention of HPV-related cancers, thus improving the lives of children for years to come.

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