REVIEW

Addressing HPV vaccine myths: practical information for healthcare providers

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ABSTRACT

Human papillomavirus (HPV) vaccine uptake consistently lags behind that of other adolescent vaccines. In 2017, uptake of a single HPV vaccine dose and HPV vaccine series completion was 66% and 49%, respectively, compared to uptake of tetanus, diphtheria, and acellular pertussis vaccine (89%) and quadrivalent meningococcal conjugate vaccine (85%). Reasons for not vaccinating adolescents again HPV are varied, and in many cases, are rooted in commonly spread myths and misperceptions about the vaccine. In this review, we address five key myths – HPV vaccination is not effective at preventing cancer; Pap smears are sufficient to prevent cervical cancer; HPV vaccination is not safe; HPV vaccination is not needed since most infections are naturally cleared by the immune system; 11–12 years of age is too young to vaccinate. For each myth, we summarize the scientific evidence refuting the myth and provide speaking prompts for healthcare professionals to communicate about HPV vaccination.

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Introduction

Human papillomavirus (HPV) vaccination was first recommended for use in the United States (US) for female adolescents and young adults in 2006¹ and male adolescents and young adults in 2009.² Despite this, HPV vaccine coverage remains suboptimal, and lags behind that of other routinely recommended adolescent vaccines. In 2017, uptake of at least one dose each of tetanus, diphtheria, and acellular pertussis booster (Tdap) and quadrivalent meningococcal conjugate vaccine (MCV4) by United States (US) adolescents aged 13–17 was 89% and 85%, respectively. This stands in contrast to receipt of at least one dose of HPV vaccine (66%) and being up-to-date with the HPV vaccine series (49%).³ Vaccine hesitance has increasingly been identified as a key factor in suboptimal vaccine uptake,^{4–12} and this has been well-documented for HPV vaccination.^{13–26}

Previous research has identified multiple barriers to high acceptance and uptake of HPV vaccine,^{27–29} and earlier reviews have summarized the available evidence supporting HPV vaccination as a safe and effective cancer control method.^{30–34} Many of these reviews have focused on specific outcomes, such as reviewing and synthesizing available vaccine effectiveness data or broadly summarizing the current state of the knowledge about HPV vaccine. One review is notable in that it directly addressed a number of myths negatively impacting HPV vaccine perceptions and uptake.³⁴ Since this review was published in 2013,³⁴ there have been numerous advances in our knowledge of the safety and effectiveness of HPV vaccination.

This current review presents five common myths and misperceptions about HPV vaccination, followed by a summary

of the evidence addressing each myth. This follows the same format as a series of presentations on this topic to healthcare providers in 2017–2018 (available for viewing for continuing medical education/continuing education credit at <https://bit.ly/2RcoWnB>).³⁵ The material from these presentations has been summarized in this manuscript to provide healthcare providers and public health practitioners readily available access to evidence necessary to address specific concerns about HPV vaccine, while also providing speaking prompts for addressing these myths with patients. It is important to note that this review summarizes key findings in a manner designed to assist healthcare providers in speaking with parents about HPV vaccination, and is not a systematic review of all available evidence about the safety and effectiveness of HPV vaccination. In addition to the narrative review, [Table 1](#) presents a series of speaking prompts to assist health care and public health practitioners communicate in response to these myths.

Myth 1: HPV vaccine has not been shown to prevent cervical cancer

Because clinical trials supporting licensure of HPV vaccines used endpoints of HPV infection and pre-cancerous lesions or abnormal cytology, and not direct measurements of reduction in HPV-related cancers,^{36–49} it has been posited that it is incorrect to say that HPV vaccine can prevent cancer.^{50–52} Additionally, because the vaccine is considered to be a “new” vaccine that has not been tested long enough to show reductions in cancer, the effectiveness of the vaccine has been called into question.^{50–52}

Table 1. Summary of main myths about HPV vaccination and examples of speaking prompts to address these myths.

Myth	Speaking prompt to address the myth
"HPV vaccines were only tested against pre-cancers, and have not been shown to prevent cancer."	Because HPV-related cancers can take decades to develop, the initial clinical trials were conducted using pre-cancers as the endpoint. Continued monitoring over more than a decade of vaccine use has already found decreases in HPV cancer rates in those who have been able to get vaccinated.
"We have Pap smears, why do we need HPV vaccination?"	Pap smears have been very effective at reducing cervical cancer rates in the US. But, HPV vaccination can prevent more cancers than just cervical cancer, and can also prevent the pre-cancers that we look for when doing Pap smears, which can lead to less need for treatment for these pre-cancers.
"HPV vaccines have not been tested enough."	HPV vaccines were tested in clinical trials of tens of thousands of participants before they were approved for use in the US. And since 2006, when HPV vaccine was licensed and recommended, there have been many large studies, ranging from hundreds of thousands to over 3 million people evaluated, that continue to confirm the safety of HPV vaccination.
"HPV vaccines are very new, so shouldn't we wait to vaccinate?"	HPV vaccines were first recommended for use in the US in 2006, around the same time as two other common adolescent vaccines – the Tdap vaccine that prevents tetanus, diphtheria, and pertussis, and the meningitis vaccine. HPV vaccine is no newer than these vaccines.
"HPV vaccine is not safe – it can lead to death."	While there have been deaths reported to the CDC after HPV vaccination, these have been investigated and there is no evidence that the vaccine led to any of these deaths. In a large study of over 2 million adolescents and young adults who died within a year of receiving any vaccine, there was no consistent pattern of deaths after vaccination, and there was only one adolescent who died within a month of receiving HPV vaccine.
"HPV vaccine is not safe – it can cause autoimmune disease."	There have been multiple studies, ranging from hundreds of thousands to over 3 million people that have failed to find any consistent relationship between HPV vaccination and autoimmune diseases.
"HPV vaccine is not safe – it can cause ovarian failure."	This concern came out of a few small case reports that did not actually show a connection between HPV vaccination and ovarian failure. In fact, early ovarian insufficiency is more common than you might expect, affecting about 1 in 10,000 young women. In a study of almost 200,000 young women, 46 developed ovarian insufficiency, but none of those cases were associated with HPV or other routine adolescent vaccines.
"Our bodies do a good job of clearing HPV infections. 90% of them are taken care of by the immune system."	We are lucky that our immune systems can do such a good job of clearing HPV infections, and 90% of these infections are cleared this way. But HPV is such a common infection that even at this high level of clearance, there are still many women who cannot clear HPV on their own. Because we don't know who will or will not be able to clear HPV on their own, we want to vaccinate all adolescents to keep them protected.
"Isn't 11 or 12 years too young to vaccinate? Won't the vaccine wear off?"	HPV vaccination actually produces an immune response that is stronger than natural infection, and in follow-up from the large clinical trials, has been shown to persist steadily for at least 5 to 10 years. In fact, the vaccine works even better when given at younger ages, which is why we only need to give two doses before age 15 to get the same protection as three doses after 15.
"Isn't 11 or 12 years too young to vaccinate? Children aren't even sexually active, so they're not at risk for HPV."	We don't like to think about teenagers being sexually active, but we do know that about 16% of boys and 11% of girls have had sex by age 15, and about half have had sex by age 17. Vaccinating early gives us the best chance to protect them well in advance of any sexual activity. It's just like wearing a seatbelt – we put it on every time we get into the car, to make sure we are always protected.
"Isn't 11 or 12 years too young to vaccinate? Won't that send the message that they can be sexually active?"	This is a question that has been studied multiple times, and in every case, we have seen that adolescents who get HPV vaccine are no more likely to have sex or engage in high-risk behaviors than adolescents who do not get HPV vaccine.

Addressing myth 1

This misperception about HPV vaccine clinical trials does not account for the natural history of HPV infection and HPV-related disease development.⁵³⁻⁵⁶ While not all HPV infections or high-grade cytological lesions will lead to development of invasive cancer, these early outcomes are necessary steps in the causal pathway of cancer. It has been estimated that the proportion of cytological abnormalities regressing to lower grades or absence range from 57% for cervical intraepithelial neoplasia grade 1 (CIN1) to 32% for cervical intraepithelial neoplasia grade 3 (CIN3). However, that same review documented that whereas only 1% of CIN1 progress to invasion, 12% of CIN3 progress to invasion.⁵⁷ Preventing these high grade lesions interrupts the natural history of HPV-related disease.⁵⁸

Evidence for prevention of high-grade pre-cancers

The effectiveness of HPV vaccine continues to be studied in both continued follow-up of initial clinical trial participants and post-licensure studies. Initial clinical trials documented

vaccine efficacy against vaccine-type cervical intraepithelial neoplasia grade 2 or higher (CIN2+) of 95% to 98%, and 100% against high grade vaginal and vulvar lesions.^{1,59-61} A recent evaluation of high-grade cervical pre-cancers in a surveillance site in Tennessee documented average annual decreases in CIN2+ of –24% in 18–20-year-olds and –10% in 21–24-year-olds in the HPV vaccine era.⁶²

Evidence for prevention of cervical cancer

Early estimates of US national-level reduction in cervical cancer incidence were published in 2018 by Guo et al.⁶³ That study compared cervical cancer rates between 2003–6 and 2011–14 for age groups for whom HPV vaccine has been recommended (15–24 years and 25–34 years of age). Relative to 2003–2006, cervical cancer rates were 29% lower in 2011–14 for 15–24-year-olds and 13% lower for 25–34 year-olds, with no differences observed in women aged 35 and older.⁶³ In a long-term (up to 12 years post-vaccination) per-protocol follow-up of 2,084 women from the FUTURE II

HPV vaccine clinical trial, only one breakthrough cytological abnormality (cervical intraepithelial neoplasia [CIN] grade 1 [CIN1]) was detected among those vaccinated, with no cases of invasive cancer identified.⁶⁴

Effectiveness in preventing genital warts

As genital warts typically develop more quickly following incidence HPV infections than anogenital cancers, they provide a good model for early effectiveness studies. Genital wart incidence within 36 months of a new HPV-6 or HPV-11 infection is 64%.⁶⁵ This rapid development of external lesions offers a mechanism for studying population-based HPV vaccine effectiveness in genital wart prevention. In clinical trials, HPV vaccination efficacy against genital warts ranged from 89 to 98%.^{1,59,60} Numerous post-licensure surveillance studies and reviews⁶⁶⁻⁷² have also identified decreases in genital wart development among vaccinated populations, both through assessment of population-level differences relative to HPV vaccine uptake^{66,67,71} and through direct comparison of vaccinated and unvaccinated individuals.^{68,69,72}

One of the earliest studies to show decreases in genital warts after achieving high HPV vaccination was conducted in Australia, where HPV vaccine series completion rates for adolescent females reached 73% by 2010.⁷³ The proportion of clinic visits for new genital warts cases declined from the period pre-2007 (before vaccine introduction) and 2011 (when surveillance for this study was completed) for women under 21 years (11.5% in 2007 to 0.9% in 2011), women 21–30 years (11% in 2007 to 3% in 2011), men under 21 years (12% in 2007 to 2% in 2011), men 21–30 years (18% in 2007 to 9% in 2011).⁶⁶ This is notable because females younger than 21 years were the priority group for vaccination, and decreases in genital warts in other related populations provides evidence of breaks in the chain of transmission through community protection, otherwise commonly known as herd immunity.

HPV is not a “new” vaccine. At the time of this review (2018), HPV vaccination has been recommended for over 12 years in the US. HPV vaccine was first recommended¹ within a year of two other routinely recommended adolescent vaccines – tetanus, diphtheria, and acellular pertussis vaccine (Tdap)⁷⁴ and quadrivalent meningococcal conjugate vaccine (MCV4)⁷⁵ – all of which are recommended for administration at ages 11–12 years.⁷⁴⁻⁷⁸

Myth 2: pap smears are sufficient to prevent cervical cancer

Because Pap smears are an effective means of identifying cervical pre-cancers to trigger treatment, some have argued that they offer a better means for cervical cancer prevention than vaccination.^{50,52,79}

Addressing myth 2

The impact of Pap smears on reducing cervical cancer incidence and mortality cannot be overstated. In every country where Pap smear testing has been implemented, the incidence rate of cervical cancer has significantly decreased.^{80,81}

However, Pap smear testing can only identify cervical pre-cancers, and does not address other HPV-related anogenital cancers (vaginal, vulvar, penile, and anal cancer) or oropharyngeal cancers. Globally, cervical cancer is the most common HPV-related cancer, with over 527,000 new cases per year.⁸² While there are 12,000 new cervical cancer cases per year in the United States, there are also approximately 12,000 new cases of vaginal, vulvar, anal, and oropharyngeal cancers in women in the US each year, and nearly 19,000 new cases of anal, penile, and oropharyngeal cancers in men in the US each year,⁸³ highlighting the non-cervical cancer burden of HPV.

It is also notable that the same high-grade lesions (CIN grades 2/3 [CIN2/3]) that typically trigger initiation of treatment when discovered as part of Pap smears are the same high-grade lesions that were used as endpoints in many of the clinical trials. To accept the logic that these endpoints are not adequate to support HPV vaccination as a cancer prevention method would be akin to indicating that Pap smears have not prevented any cases of cervical cancer, but merely served as a mechanism to treat high-grade lesions without impact on cancer development.⁵⁸

Myth 3: HPV vaccines are not safe nor have they been sufficiently tested

Concerns over the safety of HPV vaccine have been widely cited as a major parental barrier to HPV vaccine acceptance and adolescent and young adult HPV vaccine uptake.^{23,24,84-87} Additionally, concerns about vaccine safety have been widely disseminated through online channels, reaching wide audiences. This has included high-profile coverage of individuals who died after HPV vaccination.^{88,89} The main concerns raised about the safety of HPV vaccination have focused on death following vaccination,^{88,89} autoimmune and neurological conditions,⁹⁰⁻⁹⁸ and premature ovarian insufficiency (POI) or ovarian failure.⁹⁹⁻¹⁰⁵

Addressing myth 3

Multiple clinical trial and post-licensure studies have identified a positive safety profile for HPV vaccination, with no associations identified for serious adverse events, and triggering appropriate updates to vaccination practices for other less severe adverse events following immunization.

Vaccine safety data from clinical trials

As summarized in the published recommendations of the Advisory Committee on Immunization Practices and the vaccine package inserts,^{1,59,60} HPV vaccine recipients in multiple pre-licensure clinical trials comprised of tens of thousands of participants were more likely to experience acute injection-site reactions (i.e. pain, swelling, redness at the injection site) than placebo recipients, but experienced systemic adverse events (e.g. headache, nausea) at similar levels to those seen in placebo recipients. Additionally, autoimmune disease incidence during the clinical trials did not differ between vaccine and placebo recipients.^{1,59,60}

Post-licensure general safety assessments

Routine post-licensure surveillance through both the Vaccine Adverse Events Reporting System (VAERS) and Vaccine Safety Datalink (VSD) have consistently found no safety signals or elevated risks of specified adverse events, with the exception of syncope.^{33,106,107} One large study (over 600,000 HPV vaccine dose administrations) identified a significantly elevated risk of syncope following HPV vaccination.¹⁰⁷ This is in-line with VAERS-based surveillance that found higher reporting of syncope after adolescent vaccines in general.¹⁰⁸ These findings supported recommendations that adolescents remain seated or laying down for 15 minutes after vaccination to prevent falls and fall-related injuries.¹⁰⁸

Post-vaccination deaths

Post-licensure surveillance of deaths after HPV vaccination through VAERS identified no consistent association between HPV vaccine receipt and death, in terms of dose, timing, or cause of death.^{106,109} These findings have been supported through a VSD analysis of deaths in the 30 days after vaccination among 9–26-year-olds. That study found no association between vaccination and death within that 30-day window, for any vaccines evaluated.¹¹⁰

No evidence of increased autoimmune and neurological conditions

Numerous large studies have been conducted to evaluate the potential for increased risk of autoimmune disease after HPV vaccination. These include evaluations of nearly 350,000 HPV vaccine dose administrations,¹¹¹ 270,000 girls,¹¹² 568,000 boys,¹¹³ nearly 1,000,000 adolescent females aged 10–17 years¹¹⁴ and 3,100,000 adult females aged 18–44 years¹¹⁵. While a few significantly elevated relative risks for autoimmune disease development were identified in some studies (Bechet's syndrome, Reynaud's disease, Type 1 diabetes in one study¹¹⁶; celiac disease in one study¹¹⁵; vitiligo and narcolepsy in one study¹¹³), there were no consistencies in the outcomes for which elevated risks were identified, the time period after vaccination in which the outcomes developed, or the vaccine dose proximal to the outcome, and no causal association could be identified for any of these condition.^{111–115} One explanation for these elevated risks in administrative data analysis is the potential of unmasking, whereby the medical encounter at which vaccination was administered also triggered other examinations that led to diagnosis with the autoimmune condition after vaccination.¹¹⁷

No evidence of POI

Concerns about POI have been promulgated primarily through animal models, case reports, or ecological analyses evaluating pregnancy rates as a function of the proportion of the population vaccinated against HPV,^{99–105} but not through large epidemiologic studies. In 2018, a large managed care organization-based study of nearly 200,000 females aged 11–34 years found no association between adolescent vaccination and POI. In this study, there were 120 diagnoses adjudicated, with 46 confirmed POI diagnoses. No significantly elevated risks for POI were estimated for receipt of any of four vaccines, including HPV vaccine. Notably, only 1 case received HPV vaccine prior to symptom onset.

Myth 4: HPV vaccines are unnecessary because most people clear HPV infections naturally

Because estimates from HPV natural history research have identified that approximately 90% of new HPV infections are cleared by the immune system within two years,^{118–120} the need for HPV vaccination has been erroneously called into question, in favor of natural immunity.^{121,122}

Addressing myth 4

HPV acquisition, particularly after the onset of sexual activity, is often rapid. Notably, in a cohort of university women, 39% had at least one new incident HPV infection within 2 years of study enrollment, and more than 60% had a new incident infection after 5 years.¹²⁰ In continued follow-up of this population, approximately 90% of incident HPV infections were cleared by the immune system within two years of detection.^{65,118} These estimates of HPV acquisition and clearance were similar to those identified in a separate cohort of newly sexually active females.¹¹⁹ However, for HPV infections that do not clear, there is also often a rapid development of HPV-related cytological changes and genital wart development.^{65,119} While more than half of low-grade (CIN1) and one-third of high-grade (CIN3) will regress even if untreated, more than half of CIN3 will persist, and approximately 12% will progress to invasion.⁵⁷

While the 90% clearance estimate represents a substantial proportion of HPV infections, it needs to be put into context of the number of HPV infections that occur. Assuming approximately 32,568,000 females aged 15–29 years in the United States in 2017,¹²³ with a 24-month incidence of vaccine-type HPV of 32.3% in the absence of vaccination,¹¹⁸ we would expect over 10.5 million new cases of HPV infection over a two-year period. Even if 90% of these are cleared by the immune system,^{118,119} there will still be more than one million women with persistent infections that could progress to cytological abnormalities.

Myth 5: 11–12 years of age is too young to vaccinate

Multiple concerns have been raised about recommending and administering HPV vaccine at ages 11–12 years. First, there are concerns about whether vaccination at 11–12 years of age will last long enough to protect individuals when they may be exposed to HPV in later adolescence and adulthood.¹²⁴ Second, because HPV is most commonly spread through sexual activity, opposition has been raised to vaccinating pre-teenagers because of a perception that they do not need to be vaccinated if they are not sexually active. Notably, this perception is held by both parents (“It’s like blaming a kid before they even get a chance to do anything”) and healthcare providers (“I rarely give it at 11 or 12. I most commonly give it in the like 8th, 8th to 10th grade range when sexual activity would put them at risk, rather than just an age. This is what I tell parents: it’s very different than other vaccines because you can quantify your risk by what you’re doing.”).¹²⁵ Third, concerns have been raised that early vaccination sends a message that adolescents now have permission to become sexually active.^{126–128}

Addressing myth 5

There are many reasons why HPV vaccination is recommended at ages 11–12 years of age, including the strength of the immune response at younger ages, inclusion in the broader adolescent vaccine platform, and vaccination prior to onset of sexual activity when individuals could be exposed to HPV infection.

High HPV vaccine immune response at earlier ages

Clinical trial data has documented that, for both males and females, receipt of HPV vaccine prior to 15 years of age results in HPV antibody titers approximately twofold higher than when vaccination is provided at 15 years of age or older.⁶¹ These findings, along with clinical trials showing sustained high antibody titers following two doses of HPV vaccine given at younger ages,^{129,130} led to the 2016 recommendation change for two vaccine doses for adolescents younger than 15 years of age.⁷⁷

Sustained immune response and protection

HPV antibody titers have been documented to persist a minimum of five¹³⁰ to eight¹³¹ years, based on available follow-up data, with statistical modeling estimating at least 20 years of antibody persistence.¹³⁰ Antibody titers do decline from their peak, with a plateau approximately 18 months after the vaccine series is complete. Notably, even with this decline, vaccine-induced antibody concentrations are approximately an order of magnitude higher than antibody titers following natural HPV infection.¹³² In a per-protocol analysis of 2,084 women from the FUTURE II HPV vaccine clinical trial, sustained effectiveness was noted for up to 12 years post-vaccination, with only one breakthrough cytological abnormality (CIN1) detected among those vaccinated.⁶⁴

The 11–12-year-old vaccine platform

Three vaccines – HPV vaccine^{77,78}; tetanus, diphtheria, and acellular pertussis vaccine (Tdap)⁷⁴; quadrivalent meningococcal conjugate vaccine (MCV4)⁷⁵ – are recommended for administration at ages 11–12 years.^{74–78} High coverage of both Tdap and MCV4³ indicate that adolescents are seeking medical care where vaccines are administered, highlighting the potential for increasing HPV vaccine through reduction of missed opportunities. Concomitant administration of these vaccines can reduce missed opportunities, and lead to higher coverage of all adolescent vaccines.¹³³

Vaccination prior to onset of sexual activity

HPV vaccine is most effective when given prior to the onset of sexual activity, when exposure to HPV may occur. Data from the National Survey of Family Growth estimates that 11% of females and 16% of males had sexual debut by 15 years of age, with the average age at first sexual intercourse of 17 years.¹³⁴ Vaccination before age 13 is important, as the Youth Risk Behavior Surveillance System estimates that 2% of female and 5% of male adolescents had sexual debut before age 13.¹³⁵

These statistics highlight the importance of early vaccination. The notion that because a child is not sexually active, they do not need to be vaccinated against HPV ignores the goal of vaccination – to stimulate an immune response prior

to exposure to reduce the likelihood of disease development. The idea that 11–12 years of age is too young to vaccinate because a child is not at risk of sexual activity is akin to the idea that because the likelihood of a motor vehicle crash is low, it is unnecessary to wear a seat belt prior to being involved in a car crash.

HPV, while being the most common sexually transmitted infection,¹³⁶ is not exclusively sexually transmitted. HPV is an epithelial virus, and can be spread by skin-to-skin contact, not requiring sexual intercourse or fluid transfer.¹³⁷ A recent systematic review highlighted non-sexual and non-penetrative sexual modes of transmission of HPV, including digital-genital contact, fomites (including sex toys, ultrasound wands, and reusable specula), and shared clothing. While rare, these findings do highlight the ability of HPV to spread without sexual activity.¹³⁸

HPV vaccine does not increase sexual promiscuity

Numerous studies, including parental and adolescent/young adult surveys about post-vaccination behaviors,^{139–141} evaluations of age at sexual debut and number of sexual partners among HPV vaccinated and unvaccinated individuals,^{142,143} and evaluations of clinical outcomes (e.g. sexually transmitted infection incidence, pregnancy) related to sexual activity among HPV vaccinated and unvaccinated individuals,^{144–146} provide consistently reproducible evidence that HPV vaccination is not associated with increased sexual activity. Prior systematic reviews have summarized these data to support the lack of association between HPV vaccination and promiscuity.^{139,147}

Conclusions

There are numerous reasons why parents may be hesitant to vaccinate their children against HPV, and why healthcare providers may be hesitant to strongly and consistently recommend HPV vaccination. Five of the most common and impactful myths related to HPV vaccination (HPV vaccine has not been shown to prevent cervical cancer; Pap smears are sufficient to prevent cervical cancer; HPV vaccines are not safe nor have they been sufficiently tested; HPV vaccines are unnecessary because most people clear HPV infections naturally; 11–12 years of age is too young to vaccinate) have been summarized here, with links to examples of how these myths can be spread through social media or other platforms. For each of these myths, we have presented the key findings that refute these myths, to give healthcare providers readily available access to these key findings to facilitate communication within the clinical practice.

Improving the ability of providers to communicate about vaccines, including assessments of optimal timing for vaccine discussions, can lead to an increase in parental vaccine confidence.^{148–150} Notably, this fits in with recently developed multi-level theoretical models addressing a broader systems perspective for promoting preventive behaviors, by addressing barriers as the healthcare practice-, provider-, and patient-levels concurrently.¹⁵¹

One method for improving provider communication – taking a presumptive announcement approach to vaccine

recommendations (e.g. “Your child is due for three vaccines – meningitis, HPV, and Tdap – and we are going to vaccinate them today”) – has been shown to improve vaccine uptake relative to a more conversational approach.¹⁵² However, parents may still have questions based on myths and misperceptions they have been exposed to. Key evidence to address these myths has been summarized above, and speaking prompts – designed to not contain detailed statistics or medical jargon – have been presented to assist in these communications.

This review has some limitations. It is a narrative review, designed to provide direct access to key parts of the vast, and ever-growing evidence base supporting HPV vaccination. It was not designed as a systematic review, but rather as a summary of current evidence that healthcare providers can use as a readily available source of information to help support their conversations with patients and parents. Future avenues of research should include more targeted systematic reviews of the data addressing each of the myths presented in this manuscript, to allow a more rigorous accounting of the extensive evidence supporting the safety and effectiveness of HPV vaccination. Additionally, this manuscript does not include an exhaustive list of all myths and misperceptions that may be encountered regarding HPV vaccination, but presents the most common. While recent research has identified patterns in reasons for parental refusal over time,¹⁵³ research such as this is still based on identifying the top reason why parents refuse, and may miss the spectrum of related reasons that exist concomitantly. Surveillance of reasons for HPV non-vaccination, accounting for the breadth of reasons for refusal, needs to continue, to ensure that these reasons are well understood, to allow for development of appropriate responses and communication strategies to help healthcare providers speak with parents about these concerns.

Time and time again, the safety and effectiveness of HPV vaccination has been confirmed through well-conducted research. However, the spread of misinformation through social media channels^{154–158} can overwhelm efforts by public health and medical practitioners to address those misperceptions. With recommendations existing to develop better communications tools, social engagement, and mass media utilization to address vaccine hesitance,¹⁵⁹ we have sought to distill the large amount of HPV-related information available into usable speaking prompts, with supporting references to provide additional information and context. This is in-line with recommendations for addressing misinformation that call for clear and easy to process communications, to avoid cognitive overload.¹⁶⁰

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