Published in final edited form as:

Women Health. 2020 ; 60(10): 1129–1140. doi:10.1080/03630242.2020.1802639.

Overcoming barriers to adolescent vaccination: perspectives from vaccine providers in North Carolina

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Abstract

To capture strategies for achieving high adolescent coverage of tetanus-diphtheria-acellular pertussis (Tdap), meningococcal conjugate (MenACWY), and human papillomavirus (HPV) vaccination, we surveyed employees of 20 North Carolina (N.C.) clinics that achieved adolescent vaccination coverage higher than the state average. One employee per clinic completed a survey summarizing clinic practices regarding adolescent vaccination; perceived barriers and facilitators to Tdap/MenACWY/HPV vaccination; and the role of “champions” who made special efforts to promote adolescent vaccination. Common perceived barriers for all vaccinations were parental opposition and logistical barriers to receiving vaccination. For HPV vaccination, employees cited parental concerns about sexual behavior and injection site pain; no school vaccination requirement; and low perceived benefit in boys. Most clinics (80%) implemented successful changes to increase adolescent vaccination: consistently offering vaccination, tracking vaccination status using existing data, providing appointment reminders, updating providers on vaccination recommendations, and expanding vaccination hours. Strategies to improve HPV vaccination included co-administration with Tdap and MenACWY, and providing reminders to complete the vaccination series. Vaccine champions strongly recommended vaccination to parents (55%) and

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educated parents on vaccination recommendations (36%). Clinics in N.C. and similar settings can implement these and other low-resource strategies to overcome adolescent vaccination barriers.

Keywords

vaccines; adolescents; providers; North Carolina; human papillomavirus; tetanus-diphtheria-acellular pertussis; meningococcal conjugate vaccine

Introduction

The Centers for Disease Control and Prevention (CDC) recommends tetanus-diphtheria-acellular pertussis (Tdap), meningococcal conjugate (MenACWY), and human papillomavirus (HPV) vaccination for all United States(U.S.) adolescents aged 11–12 years(Centers for Disease Control and Prevention 2015).However, by 2017, U.S. adolescents had suboptimal coverage of 1 dose of Tdap(89%), MenACWY (85%), and HPV vaccination (66%) (Walker et al. 2018). Further, only 53% of girls and 44% of boys years received the recommended number of HPV vaccine doses(Walker et al. 2018).

A strong recommendation from a healthcare provider is an important predictor of willingness to receive adolescent vaccination and subsequent uptake. Furthermore, providers' recommendations for any one adolescent vaccine can increase uptake of the others(Darden et al. 2013; Dorell et al. 2011; P. J. Smith et al. 2016).Thus, strategies to improve the communication around HPV vaccination using practice- and provider-centered elements could improve adolescent vaccination coverage. Behavioral interventions in the clinical setting, including increasing providers' awareness of when patients are due for HPV vaccination, active patient reminders, and improved communications around vaccine hesitancy, have increased HPV vaccine uptake in randomized trials (Walling et al. 2016). However, few studies have evaluated the benefits of having vaccine “champions”, or clinic employees who make special efforts to promote adolescent vaccination, to achieve this (Caskey et al. 2013).Clinic employees can identify feasible, successful adolescent vaccination strategies to be adopted in other settings.

This study elucidated adolescent vaccination strategies from North Carolina (N.C.) clinics that achieved adolescent vaccination coverage higher than the state average. We sought information from providers or clinic staff on how they achieved high adolescent vaccination coverage, including how they overcame barriers to vaccination and the role of vaccine champions. Study results can provide recommendations for practices facing low adolescent vaccine uptake, to ensure that their patients benefit from safe and highly effective vaccines.

Methods

Sampling and Recruitment

Between September and December 2015, we recruited respondents from 20N.C. clinics that provided vaccinations to adolescents aged 9–18 years. Eligible clinics were those who reported higher Tdap, MenACWY, or HPV vaccination coverage among age-eligible patients than the statewide coverage as of July 31, 2015. Statewide coverage for these

vaccines was 71.0%, 56.0%, and 30.8%, respectively (North Carolina Department of Health and Human Services 2017). We assessed coverage of HPV vaccination initiation (i.e. receipt of 1 dose), rather than completion of the three-dose vaccination series.

We recruited a convenience sample of respondents, leveraging personal clinical contacts and sharing recruitment materials with vaccine providers through email, telephone, and local conferences. We contacted clinics and requested to speak to a physician, nurse vaccine administrator, medical assistant, clinic manager, or other clinic staff with knowledge of the clinic's adolescent vaccination practices. Respondents self-reported their clinic's vaccination coverage. If this figure exceeded the statewide average, we invited them to complete a 50-minute telephone interview administered by a study staff member. Respondents received \$100 to participate. The University of North Carolina Institutional Review Board deemed the study not to be human subjects research and exempt from IRB review and approval.

Data Collection and Analysis

We collected cross-sectional data using an interviewer-administered questionnaire, developed in the Qualtrics electronic survey platform. We designed the questionnaire to identify common practice- and provider-based characteristics of clinics with high vaccination rates, as well as perceived barriers to adolescent vaccination and strategies used to overcome barriers, with a focus on unique barriers to HPV vaccination. Questionnaire items were adapted from validated instruments found in the literature and from recommendations for successful implementations of the vaccine champions model (American Academy of Family Physicians 2020; McRee, Gilkey, and Dempsey 2014; McRee et al. 2010; Brewer et al. 2008; Vadaparampil 2009; Islam et al. 2017; Keating et al. 2008). Practice- and provider-based characteristics were captured using quantitative items (54 items), and perceptions and descriptive responses were captured using open-ended items (17 items) (Appendix 1). The interviewer presented open-ended items to the respondents (e.g. "Thinking about your practice or clinic, what is the most important barrier to HPV vaccination?"; "What was the most important and successful change your practice made [to increase adolescent vaccination uptake]?"), and summarized the response in a free text field; responses were not audio recorded or transcribed. We then asked respondents if their practice employed a vaccine champion, and to identify the champion's role in the clinic. Respondents who identified champions selected the measures that champions used to promote adolescent vaccination in their respective practices from a list of possible options, and were allowed to offer additional responses not captured in the list. All quantitative and open-ended responses were entered into Qualtrics by the interviewer, and were subsequently exported from Qualtrics for analysis.

We charted proportions and 95% confidence intervals comparing adolescent vaccination coverage in participating clinics to NC statewide coverage as of July 31, 2015. We summarized quantitative responses as counts and percentages. The interviewer paraphrased and transcribed open-ended responses, and entered the free text into a database. A data analyst reviewed free text fields and combined similar responses into categories, based largely on intervention categories reported in a recent systematic review of HPV vaccination interventions (e.g. clinic environment and policies, individual provider and staff behaviors)

(Walling et al. 2016). A second analyst independently reviewed the categorizations, and discrepancies were resolved with a third reviewer; overall, the two initial reviewers agreed on the categorizations for 88.1% of responses. Quantitative analyses were conducted using Stata/SE 12.0 (StataCorp LP, Texas, USA) software, and open-ended responses were compiled and categorized using Microsoft Excel.

Results

Clinic characteristics

Participating clinics had higher average vaccination coverage than the state average for Tdap (86.7% vs. 71.0%), MenACWY (75.8% vs. 56.0%), and 1 dose HPV vaccination (59.6 vs. 38.0%) (Figure 1). Respondents were primarily nurses (65%), followed by practice managers (20%), certified medical assistants (10%), and one physician (5%) (Table 1). Six nurses (46%) reported also being immunization coordinators or North Carolina Immunization Registry (NCIR) administrators for the clinic. Respondents worked in private practices (45%), federally qualified health centers (20%), hospital-based clinics (15%), school-located health centers (15%), and one public health department clinic (5%) (Table 1). Clinics generally provided primary care (55%) and pediatric care (30%), with the majority (85%) using electronic health records (EHR). Two clinics (10%) reported that most of their patients did not speak English as a primary language (Table 1).

Clinics had provided adolescent vaccination services for a median 20 years (range 3.5–29 years). Three-quarters of clinics had standing orders for Tdap and MenACWY vaccination, whereas 70% had standing orders for HPV vaccination. Most clinics routinely provided adolescent vaccination at both well-child visits (95%) and uncomplicated sick visits for minor or short-term health problems (80%) (Table 1). Nurses had authorization to provide vaccines in 70% of clinics, and physician assistants and medical assistants had such authorization in 40% of clinics. All clinics actively reported adolescent vaccinations to NCIR, and participated in the federal Vaccines for Children (VFC) program to provide free vaccination to underinsured or uninsured adolescents. Sixty percent of clinics served a patient population in which most patients qualified for free vaccination (Table 1).

Barriers to vaccination coverage

Based on responses to open-ended items, clinics reported more barriers to HPV vaccination than either Tdap or MenACWY vaccination (Table 2). Parental opposition was a reported barrier for all three vaccines (HPV: n=5, Tdap: n=2; MenACWY: n=1) due to negative media perceptions of vaccines or lack of information (Table 2). Four respondents reported that parents associated HPV vaccination with increased sexual risk-taking among adolescents, and three reported logistical difficulties with initiating or completing the three-dose HPV vaccination series (Table 2). HPV was the only vaccination for which concerns about pain (n=3) arose. Further, two respondents reported that because HPV vaccination is not required for school entry, parents considered it unnecessary; and two reported that parents perceive no direct HPV vaccination benefit for boys (Table 2). As Tdap and MenACWY vaccination are required for middle school entry in N.C., one respondent reported difficulty scheduling all eligible patients to receive these vaccines prior to the beginning of the school year.

Notably, five respondents reported that parents were unclear about the purpose of MenACWY vaccination (Table 2).

When asked to describe strategies to improve adolescent vaccine uptake, respondents primarily educated parents to reduce barriers to HPV vaccination, including engaging in discussions with parents (n=14) and providing educational materials (n=6) (Table 2). Three respondents provided reminders or opportunities to return to the facility for subsequent doses, and two explored parents' concerns about HPV vaccination and initiating vaccination at early ages. For families with financial barriers to HPV vaccination, one clinic's case management department provided referrals for social services and assistance obtaining public insurance. Strategies for Tdap and MenACWY vaccination were fewer; however, four respondents verbally discussed the importance of MenACWY vaccination with parents in response to relatively poorer understanding of the vaccine and meningococcal disease (Table 2).

Clinic-centered strategies to improve vaccination coverage

Most respondents (80%) changed clinic practices to improve adolescent vaccination coverage. Successful changes commonly described in open-ended responses were consistently offering vaccination at every patient visit (n=6) and consulting NCIR and/or health records during appointments to determine a patient's vaccination status (n=5). In contrast, printing out and reviewing EHR was too time-consuming, especially for last-minute appointments (n=2), and expanded vaccination hours were either poorly attended or insufficient to meet demand, especially when required vaccinations were due (n=2). One clinic reported that direct communication with parents was superior to automated phone or mail reminders (Table 3).

Half of clinics discussed providers' vaccination rates at staff meetings. The most common systems to inform providers when a patient is due for vaccination were reviewing NCIR during or prior to patient visits (30%), and reviewing EHR or charts during patient visits (20%). Half of clinics reviewed adolescent vaccination rates at least quarterly, and most (60%) liaised with a North Carolina Immunization Branch (NCIB) representative to incorporate vaccination strategies into their clinical practices. Most clinics provided training on adolescent vaccination recommendations to providers (50%) or other clinic staff (85%), and utilized NCIB training resources (35%) (Table 3).

Champion strategies to improve vaccination coverage

Eleven clinics reported having a vaccine champion: six were nurses, two were physicians, one was a medical assistant and one was a corporate office staff member (Table 3). Champions were based in private practices (36%), federally qualified health centers (9%), hospital-based clinics (18%), school-located health centers (27%), and public health departments (9%) (Table 3). Champions most commonly made strong recommendations for adolescent vaccination (55%) and educated parents on national adolescent vaccination recommendations (36%). Twenty-seven percent of champions managed vaccination records to identify vaccine-eligible patients, recommended vaccination at all clinical opportunities,

or regularly reviewed clinic vaccination rates (Table 3). One champion (9%) in a hospital-based clinic offered providers incentives to improve adolescent vaccination coverage.

Unique strategies to improve HPV vaccination coverage

When asked to describe specific strategies to increase HPV vaccination, clinics described systems to identify patients eligible for initiating HPV vaccination and to ensure completion of the three-dose series. To identify eligible patients, reviewing NCIR during or prior to an appointment was the most common system, reported by 12 respondents, followed by reviewing EHR, reported by 6 respondents. Regarding completion of the vaccination series, clinics most commonly mailed a reminder (30%) or called parents (30%) to remind them to schedule their child's next dose (Figure 2). Thirty percent of clinics scheduled the next HPV dose at the current visit, and 30% provided electronic magnets, distributed by the vaccine manufacturer, that gave alerts when the next dose was due (Figure 2). Some clinics printed NCIR records for their patients and highlighted HPV vaccination due dates (25%), and others put a physical flag into the patient's medical record, provided reminder cards for the next appointment at the end of a visit, or educated parents on the need for follow-up doses (20% each) (Figure 2).

Discussion

Through interviews with employees in adolescent vaccination clinics, we identified strategies that clinics use to achieve high adolescent vaccination uptake, including in settings with low coverage. By surveying individuals who served various roles in their respective clinics, we received an array of perspectives on the context surrounding adolescent vaccination in N.C. Respondents considered parental education critical to overcoming barriers to adolescent vaccination, and repeatedly engaged hesitant parents in discussions about vaccine safety and effectiveness. We also identified clinic-level strategies, such as scheduling vaccination appointments to maximize convenience, and assisting families to access social services to improve vaccination accessibility. Clinics frequently used existing and low-resource tools, namely patient medical records and NCIR, to identify age-eligible patients and maximize adolescent vaccination coverage.

Our findings are consistent with previous studies, in that provider communication about vaccination encourages adolescent vaccination uptake, particularly for HPV vaccination (P. J. Smith et al. 2016; Gilkey et al. 2012). In our study, the most frequently cited strategies to address barriers to adolescent vaccination included provider-led discussions regarding the safety and efficacy of vaccination. Indeed, high-quality recommendation provider recommendation including an in-depth discussion of the benefits of HPV vaccination has been associated with over nine-times the odds of HPV vaccine initiation and three-times the odds of series completion (Gilkey et al. 2012). Further, adolescent parents who report being positively influenced to vaccinate against HPV are more likely to report that their daughter's health care provider talked about the HPV vaccine, that their daughter's HCP gave enough time to discuss the HPV shot, and that their daughter's HCP recommended the HPV vaccine (P. J. Smith et al. 2016). AsHPV vaccination is not required for school entry in N.C., respondents made unique efforts to motivate parents to initiate HPV vaccination. They

dispelled myths about HPV vaccination, incorporated HPV vaccination into a standard adolescent vaccination platform, and reduced parents' anxieties about sexual activity in their young adolescents. One successful strategy to increase HPV vaccination coverage was to emphasize the role of HPV vaccination in preventing cancers, rather than a sexually transmitted infection. The CDC endorses similar messages for communicating the benefits of HPV vaccination to patients and their parents (Malo et al. 2017).

Despite evidence that strong provider recommendations motivate HPV vaccination, not all parents receive such recommendations (Gilkey et al. 2016). We found that clinics with high vaccination rates created openings to provide HPV vaccination, using every clinical opportunity to vaccinate and creating standing orders or nursing protocols to provide vaccination without clinical encounters. Routine training from NCIB for all clinic providers and staff can help clinics develop these types of vaccination protocols and accompanying monitoring systems. Up-to-date resources from the CDC are available to train providers on approaches to increase adolescent vaccination (Jacobson, St. Sauver, and Finney Rutten 2015).

Healthcare databases have been critical for monitoring immunization coverage across the United States (Groom et al. 2015; Community Preventive Services Task Force 2015). Respondents regularly reviewed NCIR and EHR data to determine patients' eligibility for vaccination. The American Academy of Pediatrics (AAP) recommends reminder and recall systems based on EHR and immunization registry data to remind providers to provide all recommended adolescent vaccines in a single visit and follow up for subsequent doses (American Academy of Pediatrics 2017). Vaccination registries with recall systems have also been recommended by multi-state collaborations of providers, researchers, and policy-makers aiming to reduce cervical cancer disparities (J. S. Smith et al. 2013). While not all respondents used EHR, all had access to NCIR for reporting patients' vaccination status and monitoring vaccination coverage. Although NCIR is a passive reporting system and no active reporting requirements are in place, clinics across N.C. are encouraged to take advantage of this useful resource and normalize its use. Clinics without EHR can also create simple tracking systems using paper records, demonstrating that accurate vaccination monitoring can be achieved using existing information and low-technology methods.

We identified strategies that were ineffective in certain contexts. Expanded clinic hours were poorly attended in some clinics, and in other clinics expanded hours were insufficient to meet patient needs. Clinics can schedule vaccinations at the first opportunity to avoid a heavy appointment burden, particularly prior to the start of the school year, using reminder and recall systems to identify vaccine-eligible patients. However, clinics based in high schools are unable to provide early vaccination, or even timely vaccination in the recommended 11–12 age range. Further, school-based clinics generally cannot provide vaccinations during sick visits without parental consent, creating missed opportunities for vaccination. Finally, not all clinics used EHR, precluding the use of automated vaccination reminders. However, clinics with paper records can review charts prior to non-vaccination appointments and cross-reference patient information with NCIR to determine vaccination eligibility. Low-income patients and wards of the state have unique challenges in obtaining

vaccination, and clinics may have to liaise with legal and social services to access vaccination services for vulnerable populations.

Leading professional organizations, including the AAP, have endorsed vaccine champions to advocate for adolescent vaccination in clinics (American Academy of Pediatrics 2018). No studies, to our knowledge, have assessed champions' perspectives on successful strategies for increasing adolescent vaccination uptake. Focusing on N.C., a state with cervical cancer incidence and mortality rates similar to those of the U.S., promotes the external validity of our findings to other states. Our study also included various clinic and provider types from geographically diverse counties in N.C., suggesting that champion strategies can be adapted to a variety of socio-economic settings. Future work should identify strategies that are particularly useful in low-income settings or in settings where cultural practices or religious beliefs hinder adolescent vaccination uptake.

Limitations include the use of open-ended questions, as the responses are based on recall and subjective opinions, and were summarized based on the understanding of the interviewer. We also elicited respondents' perceptions of vaccination barriers, which may not reflect the opinions of patients and their families, and which may not reflect the same barriers faced by clinics with low adolescent vaccination coverage. However, the perceived barriers are consistent with those reported in a systematic review of 55 quantitative and qualitative studies among providers and parents (Holman et al. 2014). Our study used a small convenience sample of mostly private clinics, which may not be representative of all NC clinics. We do not know the rates of completion of the HPV vaccination series, so we cannot hypothesize if the reported strategies to improve series completion are effective. Finally, clinics' vaccination coverage was self-reported and not cross-checked against NCIR data, which potentially underestimates statewide vaccination coverage due to duplicate NCIR records. As a result of these limitations, the findings from this study should be interpreted as suggestions for promoting adolescent vaccination culture in clinical settings, rather than evidence-based best practices.

The strategies identified in this study are adaptable and achievable in a variety of adolescent vaccination settings. Our results suggest that leveraging existing human and technological resources can lead to measurable improvements in adolescent vaccine uptake. One key finding is the importance of using NCIR to monitor vaccination coverage; most respondents relied on this widely available tool to maintain high vaccination coverage in their settings. N.C. clinics are encouraged to report vaccination data to NCIR to improve the usability of this beneficial tool, using guidance provided by the state and the AAP. The AAP provides standards for maintaining data quality in state immunization information systems, and suggestions for summarizing these data to monitor vaccination coverage at the patient, clinic, and state levels (American Academy of Pediatrics 2016). Additionally, clinic-wide policies, such as implementing standing orders for vaccination or promoting early vaccination, can encourage providers to follow vaccination recommendations by using every opportunity to vaccinate or to discuss vaccination with parents (Immunization Action Coalition 2016). Now that the CDC recommends two doses of HPV vaccine for adolescents 14 years and younger, it remains to be seen if vaccination coverage will increase in response to reduced clinic visits and cost. Future research will monitor vaccination coverage

following this policy change, and provide enhanced recommendations based on new vaccination trends.

Acknowledgments

Funding: Merck and Co., Inc., Kenilworth, NJ USA (VT ID #51842), and the North Carolina State-Level Partnership to Increase HPV Vaccination for Cancer Prevention (P30CA016086). JYI was supported by a NIH NRSA individual pre-doctoral fellowship (F31-CA210474-01A1).

Disclosures: Dr. Smith has received research grants, served on paid advisory boards, and/or been a paid speaker for GlaxoSmithKline and Merck & Co., Inc. over the past five years. The remaining co-authors declare no conflicts of interest.

Abbreviations

CDC	Centers for Disease Control and Prevention
EHR	Electronic health record
HPV	Human papillomavirus
Tdap	Tetanus-diphtheria-acellular pertussis vaccine
MenACWY	Meningococcal Conjugate Vaccine
NCIB	North Carolina Immunization Branch
NCIR	North Carolina Immunization Registry
ACIP	Advisory Committee on Immunization Practices

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Figure 1: Percent coverage of Tdap, MenACWY, and HPV vaccination among adolescents aged 9–18 in participating clinics (n=20) compared to the state of North Carolina, 2015

Figure 1 shows the average percent coverage of Tdap, MenACWY, and HPV vaccination in age-eligible patients of the 20 participating clinics (light gray), compared to the coverage of these vaccinations in age-eligible adolescents across North Carolina, according to the North Carolina Immunization Registry as of July 31, 2015 (dark gray).

Figure 2. Strategies used to ensure HPV vaccination completion (n=20)*

Figure 2 shows the percent of participating clinics reporting the use of each strategy to promote completion of all three doses of HPV vaccine.

Table 1:

Characteristics of North Carolina clinics providing Tdap, MenACWY, and HPV vaccination services to adolescents aged 9–18 years (n=20)

Clinic Characteristics	
	<u>N (%) / Median (Range)</u>
Respondent's Role in Clinic	
Nurse practitioner, licensed practical nurse, certified nursing assistant	13 (65)
Practice Manager	4 (20)
Certified Medical Assistant	2 (10)
Physician	1 (5)
Clinic facility type	
Private practice	9 (45)
Federally-qualified health center	4 (20)
Hospital-based clinic	3 (15)
School-located health center	3 (15)
Public health department clinic	1 (5)
Main service of clinic	
Primary care	11 (55)
Pediatrics	6 (30)
Other *	3 (15)
Use paper or electronic health records	
Electronic only	17 (85)
Paper only	1 (5)
Both	2 (10)
Percentage of non-English speaking patients	
1 – 24%	12 (60)
25 – 50%	5 (25)
51 – 100%	2 (10)
Don't know/Not sure	1 (5)
Clinic Vaccination Services	
Number of years clinic has provided adolescent vaccinations	20 (3.5 – 29)
Clinic has standing orders [†] for vaccination	
Tdap	15 (75)
MenACWY	15 (75)
HPV	14 (70)
Routinely provides adolescent vaccination at well child visits	19 (95)
Routinely provides adolescent vaccination at uncomplicated [‡] sick visits	16 (80)
Non-physician providers allowed to administer vaccines	
Nurses	14 (70)
Physician assistants	2 (10)

Medical assistants	6 (30)
None (Physicians only administer vaccines)	5 (25)
Connected to the North Carolina Immunization Registry	20 (100)
Participates in the Federal Vaccines for Children Program	20 (100)
Percentage of patients qualifying for Vaccines For Children Program	
1–49%	7 (35)
50–74%	3 (15)
75–100%	9 (45)
Don't know/Not sure	1 (5)

Abbreviations: Tdap=Tetanus-diphtheria-acellular pertussis vaccine; MenACWY=Meningococcal conjugate vaccine HPV=Human papillomavirus vaccine

* Other: Communicable diseases (within health department), (n = 1); Comprehensive care for students including mental health, nutritional, health education, clinical services, (n = 1); Preventive care (e.g. vaccines, cervical cancer screening), (n=1)

[†] Standing orders authorize nurses, pharmacists, and other appropriately trained healthcare personnel, where allowed by state law, to assess a patient's immunization status and administer vaccinations according to a protocol approved by an institution, physician, or other authorized practitioner.

[‡] Uncomplicated sick visits include provider encounters for short-term health problems such as sore throat, coughs, pink eye, earaches, etc.

Table 2.

Challenges and recommendations identified by providers when providing HPV, Tdap, and MenACWY vaccination (n=20)

HPV Vaccination	# responses	Tdap Vaccination	# responses	MenACWY Vaccination	# responses
Barriers to providing vaccination*					
Parents' opposition based on negative media, lack of vaccine education or misinformation	5	Parent's opposition based on negative media or general anti-vaccine sentiment	2	Parents' uncertainty about the purpose of the vaccine	5
Association of vaccine with child's sexual risk-taking	4	Scheduling issues due to vaccination deadlines for middle school entry	1	Patients not presenting for vaccination //	1
Concern about pain from vaccine	3	Cost concerns for the underinsured	1	Scheduling issues due to vaccination deadlines for middle school entry	1
Logistics (schedules, transportation, finances, parental consent for in-school vaccination)	3	Patients not presenting for vaccination	1	Cost concerns for the underinsured [†]	1
Low completion of the multi-dose series	2			Parents' opposition based on negative media	1
Perception that vaccine is unnecessary because it is not required for school	2				
Perception of no benefit to male patients	2				
Other [‡]	1				
Practices to address barriers to providing vaccination					
Educate /patient in verbal discussion	14	Provide general education about the vaccine	2	Educate parent about the purpose and importance of vaccination	4
Provide educational materials (including Vaccine Information Sheet)	6	Actively identify and call eligible patients using clinic records	1	Actively identify and call eligible patients using clinic records	2
Provide reminders to return for subsequent doses	3	Encourage parents to come in early summer to avoid rush before school year	1	Provide general education about the vaccine	2
Explore parents' concerns	2	Do not charge an administrative fee for vaccination	1	Discuss optimal timing of vaccination	1
Offer more convenient clinic hours	2	Dismiss patient from practice	1	Encourage parents to come in early summer to avoid rush before school year	1
Other [‡]	3			Do not charge an administrative fee for vaccination	1

Abbreviations: HPV=human papillomavirus; Tdap=Tetanus-diphtheria-acellular pertussis vaccine; MenACWY=Meningococcal Conjugate Vaccine; NCIR=North Carolina Immunization Registry

* Most participants reported no barriers to Tdap (n= 15, 75%) and MenACWY (n= 10, 50%), since these are required vaccinations for school attendance. One clinic reported only providing care to patients who receive their recommended vaccinations.

[‡] Other includes: adolescents in foster care in Mecklenburg County are legally unable to obtain HPV vaccine due to political resistance.

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* Other includes: providing social services to patients and their families (n=1); provide HPV vaccine last because it is the most painful (n=1); allow foster children to consent on their own behalf (n=1).

// Respondents reported general difficulty with patients coming to the clinic for vaccination, especially if they do not participate in sports (vaccinations are required for participation).

Table 3:

Strategies used by North Carolina clinics to improve Tdap, MenACWY, and HPV vaccination coverage among adolescents aged 9-18 years

Strategies implemented by clinics (N=20)	
	Total / N (%)
Practice made changes to improve adolescent vaccine uptake	16 (80)
Offers clinicians financial incentive to improve vaccination rate	1 (5)
Practice discusses provider vaccination rates at staff meetings	10 (50)
Type of system to remind providers when a patient is due for vaccine *	
Review North Carolina Immunization Registry during or prior to patient visit	6 (30)
Review EHR or patient chart during patient visit	5 (20)
Generate automated electronic reminders from EHR	2 (10)
Review manual lists or calendars of patients due for vaccine	2 (10)
Frequency with which clinic reviews adolescent vaccination rates	
<1/year	2 (10)
1–2 times/year	7 (35)
Quarterly	7 (35)
Monthly	2 (10)
Don't know	3 (15)
Liaises with North Carolina Immunization Branch to incorporate vaccination strategies	12 (60)
Provides training on adolescent immunizations to providers and staff	
Providers	10 (50)
Other clinic staff	17 (85)
Training sources used by clinic to train clinic staff on vaccines *	
Trainings or resources from North Carolina Immunization Branch	7 (35)
CDC/ACIP/IAC resources	6 (30)
Immunization conferences	3 (15)
Mentoring or shadowing	3 (15)
Clinic-created resources	3 (15)
Manufacturer information	2 (10)
Strategies implemented by clinic-based vaccine champions [†] (N=11)	
	Total / N (%)
Champion's professional role at clinic	
Nurse	6 (55)
Physician	2 (18)
Medical assistant	1 (9)
Corporate office staff	1 (9)
Champion's clinic type	
Private clinic	4 (36)

Federally-qualified health center	1 (9)
Hospital-based clinic	2 (18)
School-located health center	3 (27)
Public health department clinic [†]	1 (9)
Champion's strategy for increased vaccine uptake [*]	
Make strong recommendations for immunizing adolescent patients	6 (55)
Improve parental awareness of recommended immunizations	4 (36)
Check/manage immunization records	3 (27)
Recommend vaccination for patients at all clinical opportunities	3 (27)
Review clinic adolescent vaccine rates	3 (27)
Outside promotion of adolescent vaccines	2 (18)
Train providers and staff to promote adolescent vaccines	2 (18)
Attend immunization conferences	2 (18)
Ensure compliance with NCIR recommendations	2 (18)
Liaise with North Carolina Immunization Branch	1 (9)
Stocking vaccine	1 (9)
Incentivize providers to achieve higher vaccination rates	1 (9)
Implement evidence-based system changes	1 (9)
Measure rates of vaccination uptake	1 (9)

Abbreviations: HPV=Human papillomavirus; Tdap=Tetanus-diphtheria-acellular pertussis vaccine; MenACWY=Meningococcal Conjugate Vaccine; EHR=Electronic health record; NCIR=North Carolina Immunization Registry; CDC=Centers for Disease Control and Prevention; ACIP=Advisory Committee on Immunization Practices; IAC=Immunization and Action Coalition

^{*} Multiple responses allowed; total may add up to more than 100%

[†] Responses limited to clinics with a designated vaccine champion (n = 11).