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# Improving HPV Vaccination Initiation and Completion Rates: A QI Project

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Improving HPV Vaccination Initiation and Completion Rates: A QI Project

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### Abstract

Human papillomavirus (HPV) is a common sexually transmitted infection in the United States and is the cause of most cervical cancers in women, as well as anogenital cancers, oropharyngeal cancer, and genital warts in both men and women (Centers for Disease Control [CDC], 2014b). The HPV vaccine is recommended for preteen girls and boys to protect against HPV infections (CDC, 2011). In line with the goal of Healthy People 2020, the purpose of this evidence-based quality improvement (QI) project was to implement a text message reminder system, and calculate the completion rate of the 3-dose HPV vaccination series among adolescents in a pediatric clinic in a small city in Texas. The results were compared to the vaccination rates from a previously used reminder system. The project was of a single-group, pre-test–post-test design. Participants were adolescents aged 9–18 years who had begun, or were set to begin, the 3-dose HPV vaccine series during the project implementation period (October 2015–April 2016). Data from a random review of 100 charts of adolescents reminded using the prior system (prior to implementation) for the same vaccine appointments were used for comparison with the new reminder system data. Enrollees received up to 3 text message reminders for each appointment. They were surveyed to evaluate their preference of a reminder system. Using data from the prior system ( $n = 100$ ), 11% of adolescents completed the three-dose HPV vaccine series compared to 46.9% from the text messaging system group ( $n = 49$ ). Both groups showed a better completion rate among females. Based on surveys, 24 (80%) were in favor of text message reminders. This project shows that text message reminders offer an effective method of sending appointment reminders to increase the initiation and completion rates of the HPV vaccine series.

## Improving HPV Vaccination Initiation and Completion Rates: A QI Project

### **Background**

HPV is the most common sexually transmitted infection that can spread from person to person during unprotected sexual activity, according to the “Morbidity and Mortality Weekly Report” (MMWR) by the CDC (2014b). HPV can cause cervical cancer; the most common cancer in women around the world (CDC, 2014c). More than 40 HPV types exist that can cause mouth and throat infections. Currently among Americans, approximately 79 million are infected and 14 million become newly infected each year (CDC, 2014b).

Because HPV is common, most sexually active men and women can contract at least one type of HPV at some point during their lives. While an infected person may not have any signs or symptoms, HPV can be transmitted to others. The CDC (2015b) has said that most HPV infections cause no symptoms and are self-limiting, but persistent infections can cause serious health problems. According to the latest data on HPV-associated cancer statistics (CDC, 2014c), each year approximately 33,200 cancers occur due to HPV in the United States, about 20,600 among females and about 12,600 among males. HPV vaccines are given to prevent certain types of HPV infections, like anal, vulvar, and vaginal cancers, while also preventing genital and anal warts (American Cancer Society [ACS], 2014.)

An estimated 510,000 newly diagnosed cervical cancer cases and 288,000 deaths can occur globally due to HPV (Saslow et al., 2007). They also mentioned that in the United States, anal cancer is diagnosed in approximately 4,000 people annually (620 deaths) with 80% to 90% caused by either HPV16 or HPV18. There are approximately 3,570 vulvar cancer cases annually (870 deaths), of which 40% are HPV related. The incremental cost of cancer treatment for local and regional cancer was \$13,935 and \$26,174 and by 12 months, it was increased to \$15,868 and

\$30,917, respectively (Subramanian et al., 2010). The estimated lifetime direct medical cost of HPV is \$1.7 billion (Owusu-Edusei et al., 2013).

While an HPV vaccine is available, the rates of completion of the vaccine are not satisfactory. HPV vaccine coverage was significantly lower than coverage for other routine early-adolescent immunizations, with males less likely than females to initiate and/or complete the three-dose HPV vaccine series (Donahue, Stupiansky, Alexander, and Zimet (2014). Although many of the previous studies have shown high parental acceptance of the HPV vaccination, some parents are concerned due to issues like increased risky sexual behavior, the possibility of side effects, worries about the cost/benefits of vaccination, efficacy, safety issues, age of vaccine administration, lack of physician recommendation, and the vaccine's link to a sexually transmitted infection (Ogilvie et al., 2007; Olshen, Woods, Austin, Luskin, & Bauchner, 2005; Perkins & Clark, 2013; Waller, 2006; Zimet, Rosberger, Fisher, Perez, & Stupiansky, 2013.)

An estimated 45 million doses of vaccine were distributed in the United States after the HPV vaccine's introduction, but vaccine completion rates remain low (Conroy et al., 2009). The CDC (2015a) estimated that the analysis of the 2014 National Immunization Survey (NIS) data among teens has shown higher rates of HPV vaccination among adolescent females, Blacks, Hispanics, or those living below poverty but still noted lower rates for series completion among those groups.

The cost of three doses of Gardasil is approximately \$500 including the cost of administration (ACS, 2014). The "Vaccines for Children" program by the CDC (2014b) offers vaccines at no charge for eligible children. Providing age-appropriate vaccinations to children

will help prevent communicable disease and ultimately improve their health, thus reducing the cost of health care.

### **Problem Statement**

One of the criteria in their STD treatment guideline, the CDC (2015b) suggested that providers use prevention counseling to reduce STD/HIV risk. Moreover, in 2011, the use of the quadrivalent HPV vaccine, Gardasil (HPV4), for males and females of a certain age range was recommended by the Advisory Committee on Immunization Practices (ACIP). Even with an effective vaccination available, acceptance and completion rates of the HPV vaccine are low. Using the National Immunization Survey Teen Data of 2014, the CDC reported that despite showing a slight increase from 2013, only 60% of girls and 41.7% of boys had one dose of the HPV vaccine series. Only 39.7% of girls and 21.6% of boys had received the three doses for vaccine series completion (CDC, 2015a). Addressing the importance of HPV vaccination and the adherence to the three-dose vaccine series is addressed inconsistently in the current pediatric-practice setting. The use of text message reminders increased the HPV vaccine series completion rates in a pediatric practice (Matheson, Derouin, Gagliano, Thompson, & Blood-Siegfried, 2014). As evidence from the above mentioned studies have suggested, the current reminder methods, along with inadequate counseling on the problem and the number of vaccines available, may be factors causing the vaccine's low acceptance and completion rates. This evidence-based QI project is based on the hypothesis that proper counseling and text message reminders should increase the initiation and compliance rate of the three-dose series HPV vaccination among the target population in a selected pediatric clinic in Texas.



## Review of the Literature

### Vaccine Efficacy

In two separate studies, one by Schiller, Castellsague, and Garland (2012), and another by De Vincenzo, Ricci, Conte, and Scambia, (2013), data demonstrated that both vaccines—Gardasil, a quadrivalent vaccine containing virus-like particles (VLPs) of HPV types 6, 11, 16, and 18, and Cervarix, a bivalent vaccine with VLPs of types 16 and 18—exhibited excellent safety and immunogenicity profiles. The studies also found that the vaccines had remarkably high and similar efficacy against cervical intraepithelial neoplasia grade 3 (CIN3) in women, but Gardasil showed strong protection against genital warts and vulvar/vaginal neoplasia (Schiller et al., 2012.)

The efficacy of Gardasil was assessed in four clinical trials among 20,800 women between the ages of 16 and 26 years. In follow-up studies of vaccines, a decrease in antibody titers was found. Studies also noted an initial sharp decline toward reaching a plateau in the long term. The data suggest that both HPV vaccines have different levels of cross-protection against HPV types, and there is evidence of cross-protection against CIN 2/3 and adenocarcinoma in situ (AIS) for combined HPV types 31 and 45 infections for the bivalent vaccine. The authors have suggested that immunization against HPV substantially decreases HPV-related disease (Bonanni, Boccalini, & Bechini, 2008).

There is high efficacy (> 90%) for Cervarix and Gardasil against specific HPV infections and high-grade cervical intraepithelial neoplasia (CIN 2+) according to Brotherton (2014). Brotherton reported that the quadrivalent vaccine had similar levels of efficacy against vaginal and vulvar intraepithelial lesions and genital warts. An added benefit of HPV vaccines is that they also offer cross-protection against non-vaccine HPV types for people without previous

infections. Bivalent HPV vaccines (HPV 16 and 18, Cervarix) appear to be more efficacious against non-vaccine HPV types 31, 33, and 45 than the quadrivalent vaccine (Malagón et al., 2012).

The above mentioned randomized clinical trials (RCT) support the evidence regarding the effectiveness of HPV vaccines. It is evident that HPV vaccines are effective against HPV diseases in men and women, and giving the vaccine doses before becoming sexually active can prevent HPV diseases among adolescents.

### **Factors Associated With Completion of HPV Vaccine Series**

Most of the studies' authors have discussed factors for not completing the HPV vaccine regimen, such as parental concerns about vaccine safety, cost, fear of side effects, lack of education, and physicians not recommending the vaccine. A randomized intervention cross-sectional survey was conducted among parents to explore HPV vaccine acceptability, the influence of educational information, and to discover independent predictors associated with HPV vaccine acceptability (Dempsey, 2006). The survey found that providing parents with an HPV information sheet did not improve knowledge about HPV and had little effect on HPV vaccine acceptability by parents for their children. The survey also found that attitude and life experiences were more important factors influencing HPV vaccine acceptability among parents (Dempsey (2006). Several authors (Caskey, Lindau, & Alexander, 2009; Gold, Naleway, & Riedlinger, 2013; Ogilvie et al., 2007) found that a large number of parents mentioned that a recommendation by a physician would increase HPV vaccine acceptance. This is similar to findings from other authors who suggested that from the parents' viewpoint, initiation of the HPV vaccine would increase if the parents had received a physician's recommendation

(Dempsey, 2006; Gerend, Weibley, & Bland, 2009; Gottlieb et al., 2009; Reiter, Brewer, Gottlieb, McRee, & Smith, 2009; Rosenthal et al., 2008; Yeganeh, Curtis, & Kuo, 2010).

A study also reported that few participant girls and young women believed that the HPV vaccine was protective beyond the actual impact of the vaccine. These participants thought they did not need to have Pap smears, were protected against and could worry less about getting all STDs, or no longer needed condoms during intercourse (Caskey et al., 2009). It was found that vaccine safety was a major concern among many of the parents, enough so not to vaccinate their children (Caskey et al., 2009; Fontenot, Collins Fantasia, Charyk, & Sutherland, 2014; Gold et al., 2013; Olshen et al., 2005; Perkins & Clark, 2013; Waller, 2006.) A systematic review of literature conducted by Holman et al. (2014) on barriers to HPV vaccination among U.S. adolescents found that parents most often reported the need for more information before vaccinating their children. The same authors found that parents were concerned about the vaccine's effect on sexual behavior, the low perceived risk of HPV infection, social influences, irregular preventive care, and vaccine cost. These concerns were also identified as potential barriers.

While there was high parental acceptance of the HPV vaccination, there was also parental concerns due to several issues, such as the possibility of side effects, cost and benefits of vaccination, efficacy, safety issues, age for vaccine administration, lack of physician recommendation, increase in promiscuity, and the vaccine's link to a sexually transmitted infection (Ogilvie et al., 2007; Olshen et al., 2005; Perkins & Clark, 2013; Waller, 2006; Zimet et al., 2013).

Some of the reasons preventing vaccine compliance were unvaccinated respondents' reports of foregoing the vaccine because of reasons such as not being currently sexually active,

not being at risk for sexually transmitted infections and being worried about vaccine safety. A few studies also reported parental beliefs regarding getting chronic diseases such as autism or multiple sclerosis upon receiving the vaccine, weakening of the child's immune system caused by the vaccine, the cost of the vaccine, the issue of health insurance, access to care due to transportation issues, and so on (Caskey et al., 2009; Fontenot et al., 2014).

Participants who had both a regular health care provider and a health care encounter during the previous 6 months were associated with vaccine receipt (Caskey et al., 2009). A study comparing Latino and non-Latino women found high (73%) acceptance of the HPV vaccine in non-vaccinated eligible women who stated that cervical cancer prevention was the primary motivation for getting vaccinated (Watts et al., 2009).

### **HPV Vaccine Knowledge and Improvement Based on Education**

In other studies reviewed, a majority of parents had heard about HPV and the HPV vaccine (Chang et al., 2013; Daley et al., 2010; Gerend et al., 2009; Gottlieb et al., 2009; Hughes et al., 2009; Perkins & Clark, 2013; Perkins, Pierre-Joseph, Marquez, Iloka & Clark, 2010; Yeganeh et al., 2010). Even though women knew that HPV infections caused cervical cancer, only a few knew the association between HPV and genital warts (Chang et al., 2013; Perkins et al., 2010). Almost all parents understood that HPV vaccines must be given before HPV exposure to be effective, and 95% stated that vaccination must occur before the initiation of sexual activity (Perkins et al., 2010).

More than half of the parents/guardians knew that HPV was sexually transmitted (Dempsey, 2006; Gerend et al., 2009; Hughes et al., 2009; Perkins et al., 2010; Yeganeh et al., 2010). Two sets of authors (Chang et al., 2013; Wegwarth, Kurzenhäuser-Carstens, & Gigerenzer, 2014) found that parents did not know whether the HPV vaccine prevented

precancerous lesions nor did they know that death from cervical cancer could potentially be prevented by being vaccinated. Most of the women knew that abnormal Pap smears and cervical cancer were caused by HPV (Chang et al., 2013; Dempsey, 2006; Hughes et al., 2009; Perkins et al., 2010; Yeganeh et al., 2010; Ziarnowski, Brewer, & Weber, 2009). Parents who had already vaccinated their daughters believed that they were less likely to get cervical cancer; whereas those parents yet to vaccinate their daughters said their daughters had higher chances of getting cervical cancer and that they preferred to get their children vaccinated (Ziarnowski et al., 2009).

Regarding the views of the HPV vaccine, parents who intended to vaccinate their daughters were grateful for the protection that vaccination afforded their daughters against disease, including cervical cancer (Perkins et al., 2010). On the other hand, in a study by Fontenot et al. (2014), the subjects had never heard of HPV, did not know about the HPV vaccine, and were not aware that the vaccine even existed. There was a disconnect between the actual and perceived risks of HPV and barriers to HPV vaccination.

### **Text Messaging Reminder System to Improve HPV Vaccine Adherence**

Several studies have suggested that a text messaging reminder system and educational brochures can increase HPV vaccine uptake and dose-completion rates. Kharbanda et al. (2011) found that text message reminders were an effective intervention to increase timely receipt of second and third HPV vaccines of the series. Jacobson and Szilagyi (2005) found that reminder recalls were associated with a 5–20% increase in immunization coverage. The researchers suggested that the use of more intensive reminders and recalls, along with multiple reminders, seemed to be more effective than single reminders. In Szilagyi et al.'s (2013) RCT, the telephone reminder/recall system was found to improve adolescent immunization and preventive visits, with modest cost and impact. A QI project on text message reminders for the second and third

doses of the HPV vaccine at a busy, urban pediatric practice in North Carolina conducted by Matheson et al. (2014) had similar findings. The authors suggest that use of text message reminders improved HPV vaccine series completion rates in a timely manner in the pediatric clinic. The authors also think that an increased use of smartphones served as a potential facilitator for success. There was better efficacy of text message reminders, as there was a modest increase in HPV vaccine rates in their respective studies (Stockwell et al., 2012; Rand et al., 2014). Both studies also reported that one of the challenges was making sure that patients had a working phone number to receive the text messages. Furthermore, Rand et al. (2014) suggested that along with the text messaging reminder system, office-based interventions were deemed important to improve HPV vaccination rates because of the issue of parental hesitancy to initiate HPV vaccination.

Use of an evidence-based educational-brochure reminder system significantly improved HPV vaccine uptake and completion of the dose (Cassidy, Braxter, Charron-Prochownik, & Schlenk, 2014.) These authors found that the rate of HPV vaccination improved from 24% to 75% when they compared historical control groups with an intervention group. They also noted that the methods to address issues with parents, such as the likelihood of HPV infection, cervical cancer, and its effect on health, can help cue action regarding parents' decision making on vaccines and can significantly improve uptake rates among preteen girls.

According to Jacobson and Szilagyi (2005), even though the immunization rates for children and adults are rising, coverage levels have not reached the maximum goal. Due to low immunization rates, it is important to understand and promote interventions that work in primary care settings in order to increase immunization coverage. A common theme across immunization programs in all nations involves the challenge of determining the denominator of eligible

recipients and identifying the best strategy to ensure high vaccination rates through intervention strategies involving patient reminders and recall systems.

### **Synthesis of Evidence**

Most study findings have suggested that sending timely notifications to families about the next HPV vaccine dose, by means of reminder calls or alerts, may motivate adolescents and their parents to seek medical care. In most of the research articles, researchers examined the effectiveness of the reminder and recall systems, which improved vaccination coverage. Healthy People 2020's objectives are to reduce the proportion of females with HPV infection (U.S. Department of Health & Human Services, 2015a) and increase coverage of the HPV vaccine to 80% (U.S. Department of Health & Human Services, 2015b). Evidence-based literature on HPV vaccination suggests that it is critical to focus on effective educational approaches and reminder systems to improve the vaccine uptake among the eligible children.

Nurses and primary care providers should emphasize educating parents and adolescents about the HPV vaccine, which will allow greater vaccine acceptance. Vaccine-related education for parents and adolescents should include reasons for vaccination, side effects of the vaccination, the safety of the vaccine, the vaccine dose, and the timing of the vaccine, age to initiate the vaccine, and other vaccine-related information. Saslow et al. (2007) believed that educational interventions would increase HPV vaccine compliance rates. They suggested that there is a critical need for education of providers, policy makers, parents, adolescents, and young women about early detection, cervical cancer prevention, and the need for routine screening even after vaccination.

The majority of the studies used descriptive research designs, of which one was a randomized control study. The strength of the evidence in the literature was based on the *Johns*

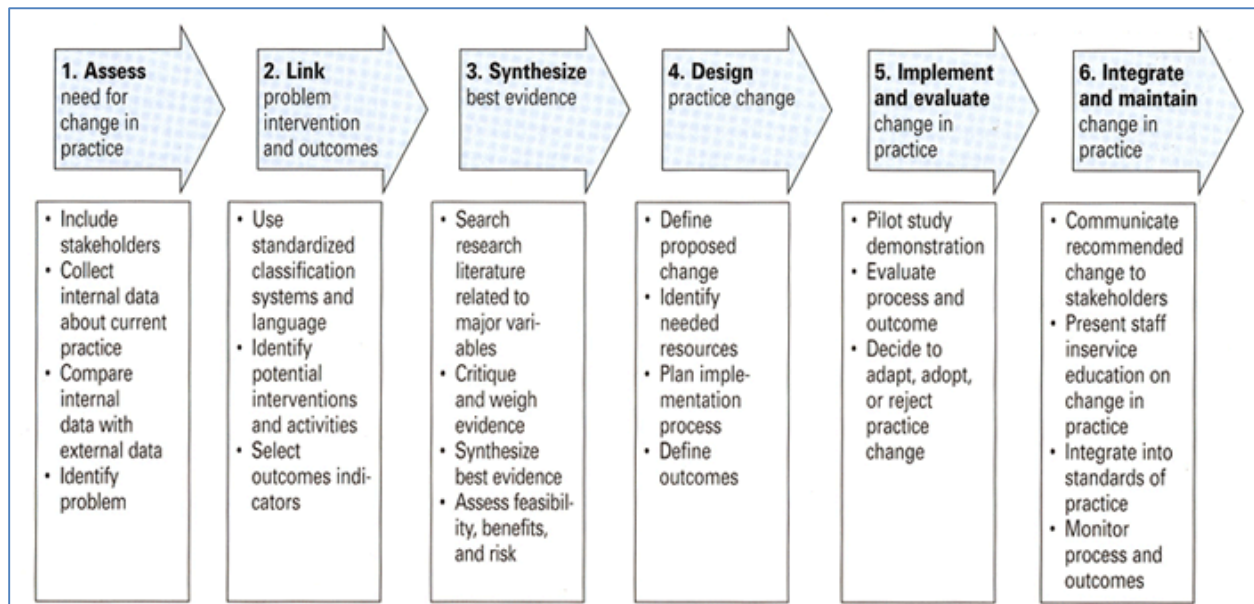
*Hopkins Nursing Evidence-Based Appraisal Guidelines* by Dearholt and Dang (2012). The strength of evidence was graded on strengths on a Level 1–3 scale, with 1 being the highest and 3 being the lowest. The evidence was rated on quality as A (*high*), B (*good*), and C (*low or majorly flawed*). Overall, the strength of all evidence could be rated as 2 and the quality of evidence as a B (*good*).

**Theoretical Framework**

Based on the necessary organizational change, the Rosswurm and Larrabee (R&L) model (Rosswurm & Larrabee, 2007) for guiding nurses through a systematic process for a change to evidence-based practice was used (see Figure 1.) This model has six constructs: (a) assess the need for a change in practice, (b) link the problem interventions and outcomes, (c) synthesize the best evidence, (d) design a practice change, (e) implement and evaluate the change in practice, and (f) integrate and maintain the change in practice.

Figure 1

*Rosswurm and Larrabee’s (1999) model for evidence-based practice.*





**Assess the Need for a Change in Practice**

In the first step of the R&L model (Pipe, Wellik, Buclida, Hansen, & Martyn, 2005); the need for change at the clinic is assessed. In this pediatric clinic, the three-dose HPV vaccine completion rate is low. Also, most of the time, the parents refuse to get their children vaccinated. According to Healthy People 2020 (HP2020, 2014), the target of HPV immunization is 80%. During each clinic visit, parents need to be encouraged to vaccinate their children, and this is possible only through timely counseling. Another reason for low vaccination initiation and completion may be due to the existing appointment system. Both telephone calls to customers and/or giving them an appointment card as reminders may not be effective enough due to patients not taking the calls or misplacing the appointment cards. This means that the staff and providers at the clinic need a change in practice.

**Link the Problem Interventions and Outcomes**

The second step of the R&L model is linking the problem with the intervention and its outcomes. Even though the HPV vaccine was introduced in 2007, the knowledge gap among parents and a lack of clinician recommendations are reasons for lower initiation and completion rates for the vaccine (CDC, 2014a). In this project the programmatic intervention is counseling the parents and implementing the text messaging reminder system, which should help achieve the desired outcome of improving the three-dose HPV vaccine's initiation and completion rates by a given period of time.

**Synthesize the Best Evidence**

Synthesizing the best evidence is the third step of the R&L model. The DNP student conducted a literature review to examine the evidence of reasons for HPV vaccine compliance and the methods that improved its compliance among adolescents. The studies cited previously

in this paper provide the best evidence for why the project is needed at the pediatric clinic. This could also help realign the clinic's practices toward the outcome of meeting the HP2020 goal of improving the HPV vaccine's initiation and completion rates.

### **Design a Change in Practice**

The fourth step of the R&L model is to design a change in practice. In the current pediatric clinic, the ineffective telephone-call reminder system and individual vaccine counseling not being offered during each visit could be reasons for the low HPV vaccination rates. Based on the evidence from this literature review, the DNP student designed a change plan to implement a "must counsel" rule and a text messaging reminder system. The change in practice included a system designed in such a way that the changes are implemented, measured, corrected, reimplemented (as needed), and confirmed for accuracy and efficiency to achieve the expected outcome of the project.

### **Implement and Evaluate the Change in Practice**

Implementing and evaluating the change in practice is the fifth step. This QI project was implemented in a pediatric clinic at Harlingen. The DNP student educated the pediatrician, nurse practitioners (NPs), and other staff regarding the new text messaging reminder system and the importance of educating parents about HPV vaccination during each visit. They were actively involved in the implementation and evaluation of the process. Any changes necessary would be evaluated, and necessary updates to the project were made using the R&L model, going back to the first step of the R&L model and continuing through the steps deemed best. This ensured a proper evaluation and implementation of the change desired and a better outcome.

### **Integrate and Maintain the Change in Practice**

The sixth and final step is to integrate and maintain the change in practice. After the three-dose vaccine regimen for the targeted age group of patients was completed, the DNP student conducted a data analysis on the impact of counseling and the new reminder system on the HPV vaccination rate. If there is an improvement and outcome goals are met, then this can be presented to the stakeholders. The immunization nurse can implement the system of changes for other vaccines at the clinic, which should improve other vaccine compliance rates, too. This would help the clinic achieve a better rating in the community and allow it to serve as a role model for other providers in the area, as well as communities all over, and meet the HP2020 goals.

### **Project Design/Methods/Implementation**

#### **Project Design**

The purpose of this evidence-based QI project was to evaluate and compare HPV vaccine initiation and completion rates using the prior reminder system to data from the QI project, in which a text message reminder system was implemented for HPV vaccine appointments. This was conducted at a pediatric clinic between Harlingen and San Benito, TX. The project was of a one group pretest–posttest design.

Data from a random review of 100 charts of adolescents aged 9–18 years (before implementation) who were reminded about their HPV vaccine appointments using the prior system (e-mails and phone calls) were provided by the clinic’s administration from their electronic health record (EHR) system. For the QI project, the eligible participants were adolescents aged 9–18 years who had already initiated or were to start initiating the three-dose HPV vaccine series during the project implementation period of October 2015-April 2016.

Enrollees received up to three text message reminders for each appointment. They were surveyed once during their visit to evaluate their preference of a reminder system.

Prior to the start of the project, the DNP student talked with the clinic's manager about setting up the text messaging reminder system and presented the feasibility and cost report to the clinic's administrators. Upon approval of the administrators, the text message reminder system was activated in the clinic's EHR software. The text messages were sent through the EHR system in English (and in Spanish for those patients/parents who preferred Spanish).

The project focused on the basic implementation plan, including conducting an orientation and training for the staff about the project, the HPV vaccine, and HPV-related diseases. The goal of the project was to implement the text messaging reminder system in the pediatric clinical site for 6 months, educate staff about the enrollment acknowledgement form for this project, and explain the additional survey at the end of each completion to evaluate the success of text messaging reminder system compared to prior reminder system to the staff.

The DNP student organized and orchestrated the following:

- trained the staff members and worked with them to select eligible adolescents between the ages of 9 and 18 years who could receive HPV vaccines (initiation, continuation, and completion) for counseling and enrolling in project,
- trained for counseling and provided HPV vaccine information,
  - trained the vaccination nurse to counseling candidates or parents on HPV vaccines for all selected patients,
  - trained the medical assistants to provide patients or parents with HPV vaccination leaflets/education materials during counseling, either in Spanish or English based on the patient preferences,

- explained the benefits and possible risk of the HPV vaccine with the parents, and
- trained the staff on the text message reminder system.

The DNP student checked the following vaccine information:

- accuracy, stock, and expiration date of HPV vaccines for the project;
- vaccine delivery to candidates and data entry;
- that all vaccines were given at the clinic after a written order from a pediatrician;
- that all HPV vaccine doses were given at the appropriate intervals according ACIP's recommendations;
- that appropriate data logging was performed by the vaccine nurse as required by state and federal laws through the EHR system used in the clinic; and
- that patients were enrolled in the reminder system to receive text message alerts for the next dose of the vaccine, as appropriate.

The DNP student received vaccine updates on a weekly basis from the clinic manager, who tracked and updated the first, second, and third HPV-vaccine information through the EHR system. In the absence of the clinic manager, the clinic's staff entered the vaccine due dates for each patient's second and third HPV dose in the EHR system. The data analysis was completed using SPSS descriptive statistics to find out the one group pretest–posttest results and compared the vaccine compliance and completion rates of the HPV vaccine in (a) the preimplementation patients who were HPV vaccine recipients in the past year (who received telephone call and/or appointment card reminders) and (b) candidates who received text message reminders for their HPV vaccine appointments. The results of the data analysis are explained using charts and diagrams.

Inclusion criteria included (a) pediatric patients who attended the pediatric clinic, (b) males and females aged 9–18 years who were registered for a visit (including walk-ins), and (c) candidates who had never received the HPV vaccine and those who had already initiated the HPV vaccine series but were in line for their second and/or third doses for HPV vaccine completion. These patients and their parents were counseled by the pediatrician and/or the DNP candidate about the importance of completing the three-dose HPV vaccine series. Patients who accepted to be vaccinated were enrolled in the project by the DNP student and were told about the benefits and risks of the HPV vaccination, text messaging reminder system, agreement form, and the single survey at the end of a vaccination appointment. The enrolled participants were asked to complete the enrollment acknowledgement form (see Appendix A) while they waited for the visit; this form included the patient's name (if the patient were a minor, parent's name as well) and the preferred cell phone number (if the patient were a minor, then that of the parent) for receipt of text message reminders. The reminder messages were sent to the patient (or parent when the child was a minor). Patients or parents (of minors) were informed that they had the right to refuse or terminate the HPV vaccination at any time after the commencement of the project.

Further HPV vaccine counseling was provided to parents of eligible children as needed (9 to 18 years old). Individual counseling on the vaccine was given during the clinic visit for patients who were 18 years old. Counseling included information about the HPV vaccine, vaccine recommendations and schedules, who should be vaccinated, when and why one should get vaccinated, the possibility of HPV infection in sexually active teens, and important vaccine information such as contraindications, efficacy, risk, and allergic reactions; they were also counseled on the benefits of getting vaccinated or vaccinating children early. After completion of

the counseling, the HPV vaccination dose was administered by the nurse and recorded in the EMR system in the clinic by the vaccine nurse. The due dates for the second and the third HPV vaccine were also entered into the EMR, and text message alerts were set up. Text message alerts for the next HPV vaccine dose were sent to each patient on the appropriate dates.

Each participant received two text message reminders per dose; the first message was sent 6 days prior to each HPV vaccine due date, and a second one was sent the day before the vaccine due date. A third message was sent the day after the appointment date if the candidate missed the vaccination appointment. The reminder messages were written as follows for the three doses of vaccine. “You are (Your child is) (past) due for your vaccine appointment. Please call the pediatric office number at (xxx) xxx-xxx regarding the vaccine appointment.” Each week, the DNP student analyzed the vaccine records provided by the office manager and tallied them by entering the vaccine data into a Microsoft Excel spreadsheet in order to track the vaccine completion status.

### **Goals, Objectives, and Expected Outcomes**

The goals, objectives, and expected outcomes are shown in detail in Table 1. The expected outcome of interest is the success of text message reminders, which should show an increase in the rates of HPV vaccine initiation and series completion at the selected pediatric clinic postimplementation compared to preimplementation. Another variable of interest is the increase in the number of patients finding the text messaging reminder system beneficial compared to the prior reminder system.

Table 1

*Goals, Objectives, and Expected Outcomes*

<b>Goal – To train the pediatric clinic staff about the importance of HPV and its prevention by the HPV vaccine</b>	
<b>Objective</b>	<b>Expected Outcome</b>
At the beginning of the project, an education session will be conducted among the staff in the pediatric clinic, emphasizing the importance of HPV and the HPV vaccine and to improve vaccination compliance.	Eighty percent of the pediatric clinic staff will attend the meeting; Eighty percent of the staff will verbalize an understanding of the education session on HPV and the HPV vaccine.
Educate providers about the importance of implementing the text messaging reminder system for HPV vaccine compliance	Eighty percent of the pediatric clinic staff will verbalize an understanding of the importance of the text messaging reminder system.
<b>Goal – To implement the text messaging reminder system into the pediatric practice clinic</b>	
<b>Objective</b>	<b>Expected Outcome</b>
The text messaging reminder system will be implemented into the practice in the clinic and checked for any flaws.	The reminder system will be implemented by the end of first week after project initiation, and the staff will be trained on using the new reminder system. Eighty percent of the staff will be able to use the reminder system without any problems.
<b>Goal – Parents and adolescents will be educated about HPV vaccination and the text messaging reminder system</b>	
<b>Objective</b>	<b>Expected Outcome</b>
The parents will be counseled and given information about HPV vaccination and the text messaging reminder system.	Eighty percent of the parents will verbalize an understanding of the importance of giving the HPV vaccination to their children.
Eligible candidates and/or parents (of minors) will have to sign the enrollment acknowledgement form and provide their cell phone number.	Eighty percent of the candidates and/or parents will sign and enroll for the HPV vaccine.
Text message reminders will be sent for each HPV vaccine dose for those enrolled.	Eighty percent of the candidates will receive the text message reminders.
Vaccine rates will be analyzed each month in the EHR system.	Significant improvement in the HPV vaccine initiation and completion rates at the clinic
Patients/parents will be provided with the survey form (see Appendix G) at end of the vaccine dose.	Eighty percent of candidates/parents will complete the survey



**Description of the Group, Population, or Community**

This QI project was conducted in an outpatient pediatric clinic situated between Harlingen and San Benito, TX. The clinic, being close to the border of Harlingen and San Benito, benefits from patients from both cities. The 2010 census (U.S. Census Bureau, 2015) showed that Harlingen had a population of 64,849, of which approximately 79.5% were Hispanic/Latino, 52.2% were female, 8.6% were children under the age of 5 years, and 30.4% were under 18. The population of San Benito was 24,253, of which approximately 90.7% were Hispanic/Latino, 51.6% were female, 9.4% were children under the age of 5 years, and 33.2% were under 18. The community of interest included girls and boys between the ages of 9 and 18 years; however, the clinic sees girls and boys up to 18 years of age. The pediatric clinic was established in 2006, and it provides care for pediatric patients, from newborns to 18 years of age. This clinic has a case load of approximately 60–75 patients per day, and it varies each day. The physician and nurse practitioner see patients based on appointments. Walk-in patients are also accepted. The goal of this pediatric clinic is to provide the best standard of care to each patient, regardless of gender or sexual identity, racial background, age, or financial status. It takes private insurance, Medicare, and Medicaid. One of the policies of this clinic is to maintain the standard of confidentiality and also to create an environment of trust and respect among the staff and patients. Services provided by this clinic are annual wellness examinations, sick visits, sports physicals, immunizations, health education, minor non-surgical procedures, routine laboratory work, and hearing tests.

**Ethics and Human Subjects Protection**

The goal of this QI project is to improve patient compliance with the three-dose HPV vaccine series and included point-of-care education by providing educational pamphlets on HPV

to the parents and adolescents, which helps to initiate and complete the three-dose series of the HPV vaccine. The project involved human subjects but did not involve any research activities on the subjects. The DNP student did not collect any health history from the candidates and/or parents other than allergies to any medications or vaccinations.

Confidentiality was maintained throughout the QI project. Patient information (including all personal identifiers) was maintained in the pediatric office per the clinic's policies. All data, including private patient information, were handled by the DNP student at the clinic only, and patient information was kept confidential throughout the completion of the project (paper, text message, etc.) and was complete compliant with the Health Insurance Portability and Accountability Act (HIPAA).

## Results

### Outcomes

**Demographic data.** A random review of data of the 100 charts of vaccine-eligible adolescents obtained from the clinic administrators suggested that the mean age of adolescents in the practice was 12.49 years ( $SD = 2.61$ ) and the age range was 9–18 years (see Table 4).

At the time of the text-messaging system implementation, there were 49 participants between 9 and 17, with mean age of 12.22 years ( $SD = 1.83$ ; see Table 5). The majority of participants were 11 and 12 years old (15 and 11 participants, respectively), or about 53% of all participants. Among all participants, 53.1% ( $n = 26$ ) were females, and 46.9 % ( $n = 23$ ) were males (see Tables 8). Of all the participants, 47 (96%) were Hispanic, 1 (2%) was White, and 1 (2%) was classified as other.

**Data analysis comparison of prior system and text messaging system.** Based on the analysis of the prior system data ( $n = 100$ ), 11% completed the three-dose HPV vaccine series. In

comparison, 46.9% (23) participants from the text messaging system group ( $n = 49$ ) completed the vaccine series. A summary of the findings is given in Table 2 below.

Table 2

*Summary of Findings (Prior vs. Text Messaging Systems)*

	Age (years) Mean (SD)	Males/Females	3-dose HPV Vaccination Series		
			Completed	Initiated	No Shows
<b>Pre-test (n=100)</b>	12.49 (2.61)	50/50	11%	6%	83%
<b>Post-test (n=49)</b>	12.22 (1.83)	23/26	23(46.9%)	26(53.1%)	0%

Both groups showed a better completion rate among females (8 and 15 participants respectively) compared to males (three males and eight males respectively). Among both groups, those who initiated the series were 6% and 53.1% (26) respectively. Data analysis also showed the following: Two males and 2 females from the prior system group and 5 (10.2%) participants (4 males, 1 female), from the text messaging system group, received only the first vaccine of the HPV vaccine series. The prior system group had one male and one female, while the text messaging system group had 12 (24.5%) participants (five males, seven females) who received the first two vaccines of the series.

Eighty-three participants (44 males and 39 females) from the prior system group and none from the text message system group were “no shows” for the vaccine series. However, nine (18.4%) participants (six males, three females) in the text message system group were “no shows” for the second or third vaccine appointment (i.e., who had received at least one vaccine with a text message reminder; see Table 3 below).

Table 3

*Analysis of All Completed Surveys*

Summary	Cases						
	Valid		Missing		Total		
	N	Percent	N	Percent	N	Percent	
Total cases with completed surveys	30	61.2%	19	38.8%	49	100.0%	
Total cases with completed surveys by gender	Male (0)	13	26.5%	10	20.4%	49	100.0%
	Female (0)	17	34.7%	9	18.4%	49	100.0%

**Text messaging system survey analysis.** Only participants who were enrolled and completed at least one of their scheduled vaccine appointments after receiving text message reminders were requested to complete the survey. Of 49 total participants, 30 valid surveys (61.2%) were analyzed. Fifty-seven percent of the respondents were female.

For questions relevant to counseling (Q1a and Q1b), twenty eight (93%) survey respondents responded that counseling improved knowledge about the vaccine. The decision to get vaccinated was effected by counseling for 63% respondents; 27% responded that counseling did not influence the vaccine decision (see Table 9 and Table 10).

The text message reminders from the clinic were received by all but one respondent. That one respondent mentioned in the comments that there was no signal at her residence. All but one respondent responded that the text reminder was helpful in remembering to attend the appointment (Q2b, see Table 12). Eighty percent of all the respondents responded that they preferred text message reminders to other forms of reminders (Q2d, see Table 14).

Evaluating the comments, 24 (80%) respondents commented positively on text message reminders. Four (13%) respondents had no comments, while one commented that e-mail or phone-call reminders were okay (Q2e, see Table 15). Among the comments, most responses

were “have easy access to phones,” “cannot take phone calls at work,” “text messages are easier,” “can be easily retrieved,” “good reminder since I always forget.” A few other comments said “text/email/phone calls are very helpful,” and one comment said “no good signal at home.” The majority of the participant comments indicated that text messaging was convenient and easier compared to other forms of reminders.

### **Resources, Facilitators, and Barriers.**

The resources used during this QI project were office supplies, an office computer, an office telephone, and time. The DNP student used the CDC’s HPV vaccine information statement to counsel the parents, and a copy of this statement was provided to each parent who participated in this project. Time was needed to counsel parents on the HPV vaccine information and to gather and analyze the data to obtain the results of the project. All staff members in the selected pediatric clinic were identified as key stakeholders. The staff members who facilitated this QI project were the pediatrician, pediatric NP, nurses, and front-desk clerk, who were in direct contact with the patients and family members. The manager of the clinic was the chief facilitator during the entire project. The DNP student conducted weekly meetings with the clinic manager for ongoing plans, updates, and feedback. When the DNP student was not in the clinic, she encouraged the staff to send text messages to the parents in a timely manner and provide the survey form to each patient after the vaccination was completed.

Some of the barriers to the project included language (some of the patients knew only Spanish), time constraints, patient compliance with appointments, and the project’s duration. Spanish-speaking patients and families were helped by the office’s nurse aides to assure effective communication. Even though the staff members were well trained in terms of the implementation of this project, the workflow at the clinic was disrupted soon after implementation. This

happened when one of the medical assistant was on leave. Getting updated and working cell phone numbers from participants was also another challenge faced by the DNP student while enrolling the participants in this project. Another potential barrier was that a few of the subjects were not showing up for scheduled appointments due to financial problems (according to the clinic staff) which could have affected the outcome of the project. The actual project duration was shorter than the desired time for completing the project. Due to this, it was not possible to evaluate the completion rates for those who initiated the vaccine series at a time after the expected implementation time (i.e., the third dose for the initiators was completed 6 months after the initial vaccine date).

Methods to address these barriers included the DNP student using the office clerks to translate the information on HPV vaccine: Pamphlets were provided in Spanish to Spanish-speaking patients. To save time, there was a need for a plan to use the patients' waiting time after registration to enroll and counsel the patients. The efforts of the clerks and nurses were important to completing that plan maintaining efficiency. Prior patient compliance issues in terms of keeping appointments made exit counseling even more important at the end of each patient visit.

### **Discussion/Interpretations**

The first goal—training the pediatric clinic staff in terms of the importance of HPV and its prevention using the HPV vaccination—was fully met. All of the pediatric staff verbalized an understanding of the education session on HPV and the HPV vaccine. The pediatrician and staff verbalized their understanding of the importance of the text messaging reminder system. The increase in knowledge among the clinic's staff was not measured, as the DNP student's main goal was to evaluate the text messaging system and its feasibility.

The second goal regarded implementing the text messaging system at the pediatric clinic so that all staff members were able to use the reminder system without any problems. The staff also verbalized that it was easy and convenient to use the text messaging system. According to staff members, it took less time to send a text message than make a phone call to a parent/subject.

The third goal of educating the parents and adolescents about HPV vaccination and the text message reminder system was evaluated using the survey. From the completed surveys (see, Table 9), most responses among the vaccine completion status groups showed that HPV-vaccine counseling helped participants understand the vaccine and its benefits (see Table 10). However, two female subjects indicated that counseling did not help.

The data from both the prior and text messaging systems in the current QI project indicated that text message reminders had a bigger impact on the participants' initiating (4% and 10.2%, respectively) and completing (11% and 46.9%, respectively) the vaccine series than e-mails and telephone reminders. The results observed in this project are in accordance with the results from a few other studies. Kharbanda et al. (2011) found that text message reminders were an effective intervention to increase timely receipt of HPV 2 or HPV 3 vaccines. The findings from Matheson et al.'s (2014) study showed improvement in the HPV series completion rate as a result of text message reminders.

The positive impact of text message reminders on the improved HPV vaccine coverage in this QI project was also confirmed through the survey data, which showed that 80% of the respondents preferred text message reminders over other reminders. This could be due to the increase in use of smartphones among the participants. Eighty percent of the parents reported that they would prefer text messaging over e-mail or phone-call reminders, since they had easy

access to cell phones and text messages did not cause any interference when they were at work. When the clinic staff was asked about how easy or difficult it was to use phone-call and e-mail reminders compared to text message reminders, staff members said that the text messaging reminder system was easier and saved more time. The clinic administrators found this system to be beneficial and expressed interest in continuing the text message reminder system for all of their clinic's appointments.

### **Suggestions/Future Recommendations**

The project results suggest that the clinic can use the text messaging system to make appointments for all of its patients, thereby increasing revenue for the clinic while improving the health of its patients through timely appointments. The clinician can actively practice preventative care and thus reduce the burden on state-funded programs like Medicare and Medicaid. The staff can also use the time saved by not making phone calls to schedule appointments for other tasks at the clinic. Moreover, since most parents may be at work during the day, text messages will be more appropriate for a majority of the patients, based on the results of the survey.

Two limitations of the study were the small sample size and the fact that the study only examined one clinic. Future implementation projects could be conducted in larger, more geographically diverse populations, for longer time periods, and at multiple clinics for generalizability. This project also did not make use of reminders for appointments for any subjects who rescheduled their appointments.

### **Conclusion**

The HPV vaccine is an important vaccine that is available in three doses and prevents certain cancers. The results of this QI project showed that text message reminders were effective



in promoting timely receipt of the three-dose HPV vaccine series. The text messaging reminder system could be used as a standard reminder system for other vaccines and appointments at this pediatric clinic and other clinics. This would help our communities keep vaccine-preventable and other diseases in check and maintain health, thus getting closer to reaching the HP2020 goal. The results of this project were presented and discussed with the pediatrician, the NPs, and other staff members at the clinic. The project will be presented during the Scholarly Presentation Day at the University of Massachusetts at Amherst, College of Nursing.

Table 4

*Frequency of Participant Age (Prior vs. Text Messaging Systems)*

Frequencies		
Participant Age (years)	Prior System	Text Messaging System
N	100	49
Mean	12.49	12.22
Std. Error of Mean	12.00	0.26
Median	11	12.00
Mode	11	11
Std. Deviation	2.611	1.829
Variance	6.818	3.344
Range	9	8
Minimum	9	9
Maximum	18	17

*Note:* Multiple modes exist for the median value for the prior system and the smallest value is shown.

Table 5

*Frequency of Participant Age (Prior vs. Text Messaging Systems)*

Participant Age (years)	Prior System		Text Messaging System	
	Frequency	Percent	Frequency	Percent
9	12	12.0	2	4.1
10	13	13.0	4	8.2
11	17	17.0	15	30.6
12	17	17.0	11	22.4
13	8	8.0	4	8.2
14	12	12.0	6	12.2
15	5	5.0	5	10.2
16	5	5.0	1	2.0
17	5	5.0	1	2.0
18	6	6.0	0	0.0
Total	100	100.0	49	100.0

Table 6

*Frequency Table of Participant Gender (Prior vs. Text Messaging Systems)*

Gender	Prior System		Text Messaging System	
	Frequency	Percent	Frequency	Percent
Female (1)	50	50.0	26	53.1
Male (0)	50	50.0	23	46.9
Total	100	100.0	49	100.0

Table 7

*Frequency of Vaccine Series Completion Status vs. Gender (Prior vs. Text Messaging Systems)*

<b>Prior System</b>	Gender		Total
	Male (0)	Female (1)	
No Shows (0)	44	39	83
Received 1 <sup>st</sup> Vaccine in Series (1)	2	2	4
Received 1 <sup>st</sup> and 2 <sup>nd</sup> Vaccines in Series (2)	1	1	2
Completed Vaccine Series (3)	3	8	11
Total	50	50	100
<b>Text Messaging System</b>	Gender		Total
	Male (0)	Female (1)	
No Show (0)	0	0	0
Received 1 <sup>st</sup> Vaccine in Series (1)	4	1	5
Received 1 <sup>st</sup> vaccine prior to project and received 2 <sup>nd</sup> & 3 <sup>rd</sup> vaccine with TM reminders to complete series (1C3)	5	5	10
Received 1 <sup>st</sup> and 2 <sup>nd</sup> vaccine in series but yet to complete series (2Y)	5	7	12
Completed Vaccine Series (3)	3	10	13
Received 1 <sup>st</sup> series prior to project and received 2 <sup>nd</sup> vaccine with TM reminders, but no show for completion (C2)	6	3	9
Total	23	26	49

Table 8

*Keys for Vaccine Series Completion Status*


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0	No Show
1	Received only first vaccine in the series
2	Received the first two vaccines in the series
3	Completed the vaccine series
2C3	Completed two vaccines prior to the project and completed the series with text messaging (TM) reminders
2CY	Completed two vaccines prior to project but has yet to come for a future appointment to complete the series with TM reminders
2C	Completed two vaccines prior to project but was a no show for the last vaccine appointment
1C3	Completed the first vaccine prior to the project and completed the series with text TM reminders
1CY	Completed the first vaccine prior to the project, received the second vaccine with TM reminders, but has yet to come for a future appointment to complete the series.
C2	Received first series prior to the project and received the second dose with TM reminders but was a no show for completion (C2)
CY	Completed the first vaccine prior to the project but has yet to come for a future second vaccine appointment
1C	Completed the first vaccine prior to the project but was a no show for the second vaccine appointment with TM reminders
2Y	Received the first two vaccines in the series with TM reminders but has yet to come for a future third vaccine appointment to complete the series
1Y	Received the first vaccine in the series with TM reminders but has yet to come for a future second vaccine appointment
Y	Has yet to come for a future first vaccine appointment

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Table 9

*Q1a vs. Vaccine Series Completion Status vs Gender*

Gender		Q1a - Did you learn more about the vaccine and its benefit?			
		No (0)	Yes (1)	Total	
Male (0)	Vaccine Series	1		1	
	Completion	1C3		4	
	Status	2Y		5	
		3		3	
Total			13	13	
Female (1)	Vaccine Series	1C3	1	3	4
	Completion	2Y	0	6	6
	Status	3	1	6	7
	Total		2	15	17
Total	Vaccine Series	1	0	1	1
	Completion	1C3	1	7	8
	Status	2Y	0	11	11
	Total	3	1	9	10
Total			2	28	30

Table 10

*Q1b vs. Vaccine Series Completion Status vs. Gender*

Gender		Q1b - Did counseling about the vaccine affect your decision to get vaccinated?			Total
				No (0)	
Male (0)	Vaccine Series	1	0	1	1
	Completion Status*	1C3	2	2	4
		2Y	3	2	5
		3	1	2	3
	Total		6	7	13
Female (1)	Vaccine Series	1C3	1	3	4
	Completion Status*	2Y	2	4	6
		3	2	5	7
	Total		5	12	17
Total	Vaccine Series	1	0	1	1
	Completion Status*	1C3	3	5	8
		2Y	5	6	11
		3	3	7	10
Total		11	19	30	

Table 11

*Q2a vs. Vaccine Series Completion Status vs. Gender*

Gender		Q2a - Did you receive a text message from the clinic reminding you of your appointment?			Total
		No (0)	Yes (1)		
Male (0)	Vaccine Series	1	0	1	1
	Completion	1C3	0	4	4
	Status*	2Y	1	4	5
		3	0	3	3
	Total		1	12	13
Female (1)	Vaccine Series	1C3	1	3	4
	Completion	2Y	0	6	6
	Status*	3	0	7	7
	Total		2	15	17
Total	Vaccine Series	1	0	1	1
	Completion	1C3	1	7	8
	Status*	2Y	1	10	11
		3	0	10	10
Total		2	28	30	



Table 12

*Q2b vs. Vaccine Series Completion Status vs. Gender*

Gender		Q2b - Was the text message reminder helpful for you in remembering to come for your visit?			Total
		No (0)	Yes (1)		
Male (0)	Vaccine Series	1		1	1
	Completion	1C3		4	4
	Status*	2Y		5	5
		3		3	3
Total				13	13
Female (1)	Vaccine Series	1C3	1	3	4
	Completion	2Y	0	6	6
	Status*	3	0	7	7
			1	16	17
Total				16	17
Total	Vaccine Series	1	0	1	1
	Completion	1C3	1	7	8
	Status*	2Y	0	11	11
		3	0	10	10
Total			1	29	30

Table 13

*Q2c vs. Vaccine Series Completion Status vs. Gender*

			Q2c - Have you received reminders in the form of telephone calls or appointment cards for the HPV vaccine appointments or any previous vaccine or clinic appointments?		
Gender			No (0)	Yes (1)	Total
Male (0)	Vaccine Series	1	0	1	1
	Completion	1C3	0	4	4
	Status*	2Y	1	4	5
		3	0	3	3
	Total		1	12	13
Female (1)	Vaccine Series	1C3	2	2	4
	Completion	2Y	1	5	6
	Status*	3	2	5	7
	Total		5	12	17
Total	Vaccine Series	1	0	1	1
	Completion	1C3	2	6	8
	Status*	2Y	2	9	11
		3	2	8	10
	Total		6	24	30

Table 14

*Q2d vs. Vaccine Series Completion Status vs. Gender*

Gender			Q2d - Did you learn more about the vaccine and its benefit?		Total
			No (0)	Yes (1)	
Male (0)	Vaccine Series	1	0	1	1
	Completion Status*	1C3	1	3	4
		2Y	0	5	5
		3	0	3	3
	Total		1	12	13
Female (1)	Vaccine Series	1C3	2	2	4
	Completion Status*	2Y	2	4	6
		3	1	6	7
	Total		5	12	17
Total	Vaccine Series	1	0	1	1
	Completion Status*	1C3	3	5	8
		2Y	2	9	11
		3	1	9	10
Total		6	24	30	

Table 15

*Q2e (Comments) vs. Vaccine Series Completion Status vs. Gender*

Gender		Q2e (Comments About Text Messaging Reminders)			Total
		Do Not Favor (0)	Do Favor (1)	Does not Matter/No Comments (9)	
Male (0)	Vaccine Series	1	1	0	1
	Completion Status* 1C3		2	2	4
	2Y		5	0	5
	3		3	0	3
Total			11	2	13
Female (1)	Vaccine Series	1	2	1	4
	Completion Status* 1C3		1	0	6
	2Y		5	0	6
	3		6	1	7
Total		2	13	2	17
Total	Vaccine Series	1	1	0	1
	Completion Status* 1C3		1	3	8
	2Y		1	0	11
	3		0	1	10
Total		2	24	4	30

\* Please refer to Table 8 for Keys for “Vaccine Series Completion Status”

## References

- Bonanni, P., Boccalini, S., & Bechini, A. (2009). Efficacy, duration of immunity and cross protection after HPV vaccination: A review of the evidence. *Vaccine*, 27(Suppl.1), A46–A53. <http://dx.doi.org/10.1016/j.vaccine.2008.10.085>
- Brotherton, J. (2014). Human papillomavirus vaccination: Where are we now? *Journal of Pediatrics and Child Health*, 50(12), 959–965. doi:10.1111/jpc.12627
- Cancer.org. (2015). HPV vaccines. Retrieved from <http://www.cancer.org/cancer/cancercauses/othercarcinogens/infectiousagents/hpv/humanpapillomavirusandhpvvaccinesfaq/hpv-cancer-and-hpv-vaccines-toc>
- Caskey, R., Lindau, S., & Alexander, G. (2009). Knowledge and early adoption of the HPV vaccine among girls and young women: Results of a national survey. *Journal of Adolescent Health*, 45(5), 453–462. doi:10.1016/j.jadohealth.2009.04.021
- Cassidy, B., Braxter, B., Charron-Prochownik, D., & Schlenk, E. (2014). A quality improvement initiative to increase HPV vaccine rates using an educational and reminder strategy with parents of preteen girls. *Journal of Pediatric Health Care*, 28(2), 155–164. doi:10.1016/j.pedhc.2013.01.002
- Centers for Disease Control. (2011). Recommendations on the use of quadrivalent human papillomavirus vaccine in males – Advisory Committee on Immunization Practices (ACIP), 2011. Retrieved from <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6050a3.htm>
- Centers for Disease Control. (2014a). Human papillomavirus vaccination coverage among adolescents, 2007–2013, and postlicensure vaccine safety monitoring, 2006–2014 —

United States. Retrieved from

<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6329a3.htm>

Centers for Disease Control. (2014b). Human papillomavirus vaccination: Recommendations of the Advisory Committee on Immunization Practices (ACIP). Retrieved from

<http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6305a1.htm>

Centers for Disease Control. (2014c). HPV-Associated Cancers Statistics, 2014. Retrieved from

<http://www.cdc.gov/cancer/hpv/statistics/>

Centers for Disease Control. (2015a). Teen Vaccination Coverage, 2015. Retrieved from

<http://www.cdc.gov/vaccines/who/teens/vaccination-coverage.html>

Centers for Disease Control. (2015b). Sexually transmitted diseases treatment guidelines, 2015.

Retrieved from

[http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6403a1.htm?s\\_cid=rr6403a1\\_w](http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6403a1.htm?s_cid=rr6403a1_w)

Chang, I., Huang, R., He, W., Zhang, S., Wang, S., & Zhao, F. (2013). Effect of an educational intervention on HPV knowledge and vaccine attitudes among urban employed women and female undergraduate students in China: A cross-sectional study. *BMC Public Health*, *13*(1), 916. Retrieved from

<http://umass.worldcat.org.silk.library.umass.edu/search?q>

Conroy, K., Rosenthal, S., Zimet, G., Jin, Y., Bernstein, D., Glynn, S., & Kahn, J. (2009).

Human papillomavirus vaccine uptake, predictors of vaccination, and self-reported barriers to vaccination. *Journal of Women's Health*, *18*(10), 1679–1686.

doi:10.1089/jwh.2008.132

- Daley, M. F., Crane, L. A., Markowitz, L. E., Black, S. R., Beaty, B. L., Barrow, J., . . . Kempe, A. (2010). Human papillomavirus vaccination practices: A survey of US physicians 18 months after licensure. *Pediatrics, 126*(3), 425–433. doi:10.1542/peds.2009-3500
- Dearholt, S., & Dang, D. (2012). *Johns Hopkins nursing evidence-based practice: Model and guidelines* (2nd ed.). Indianapolis, IN: Sigma Theta Tau International.
- De Vincenzo, R., Ricci, C., Conte, C., & Scambia, G. (2013). HPV vaccine cross-protection: Highlights on additional clinical benefit. *Gynecologic Oncology, 130*(3), 642–651. <http://dx.doi.org/10.1016>
- Dempsey, A. (2006). Factors that are associated with parental acceptance of human papillomavirus vaccines: A randomized intervention study of written information about HPV. *Pediatrics, 117*(5), 1486–1493. doi:10.1542/peds.2005-1381
- Donahue, K., Stupiansky, N., Alexander, A., & Zimet, G. (2014). Acceptability of the human papillomavirus vaccine and reasons for non-vaccination among parents of adolescent sons. *Vaccine, 32*(31), 3883–3885. <http://dx.doi.org/10.1016/j.vaccine.2014.05.035>
- Fontenot, H., Collins Fantasia, H., Charyk, A., & Sutherland, M. (2014). Human papillomavirus (HPV) risk factors, vaccination patterns, and vaccine perceptions among a sample of male college students. *Journal of American College Health, 62*(3), 186–192. doi:10.1080/07448481.2013.872649
- Gerend, M. A., Weibley, E., & Bland, H. (2009). Parental response to human papillomavirus vaccine availability: Uptake and intentions. *Journal of Adolescent Health, 45*(5), 528–531. <http://dx.doi.org/10.1016/j.jadohealth.2009.02.006>
- Gold, R., Naleway, A., & Riedlinger, K. (2013). Factors predicting completion of the human papillomavirus vaccine series. *Journal of Adolescent Health, 52*(4), 427–432.

- Gottlieb, S. L., Brewer, N. T., Sternberg, M. R., Smith, J. S., Ziarnowski, K., Liddon, N., & Markowitz, L. E. (2009). Human papillomavirus vaccine initiation in an area with elevated rates of cervical cancer. *Journal of Adolescent Health, 45*(5), 430–437. <http://dx.doi.org/10.1016/j.jadohealth.2009.03.029>
- Healthy People 2020. (2014). Immunization and infectious diseases. Retrieved from <https://www.healthypeople.gov/2020/topics-objectives/topic/immunization-and-infectious-diseases>
- Holman, D., Benard, V., Roland, K., Watson, M., Liddon, N., & Stokley, S. (2014). Barriers to human papillomavirus vaccination among US adolescents. *The Journal of the American Medical Association Pediatrics, 168*(1), 76. doi:10.1001/jamapediatrics.2013.2752
- Hughes, J., Cates, J., Liddon, N., Smith, J., Gottlieb, S., & Brewer, N. (2009). Disparities in how parents are learning about the human papillomavirus vaccine. *Cancer Epidemiology Biomarkers & Prevention, 18*(2), 363–372. <http://dx.doi.org/10.1158/1055-9965.epi-08-0418>
- Jacobson, C., & Szilagyi, P. (2005). Patient reminder and recall system to improve immunization rates. *Cochrane Database of Systemic Reviews, 2005*(3), 1-3. doi:10.1002/14651858.CD00341.pub2
- Kharbanda, E., Stockwell, M., Fox, H., Andres, R., Lara, M., & Rickert, V. (2011). Text message reminders to promote human papillomavirus vaccination. *Vaccine, 29*(14), 2537–2541. doi:10.1016/j.vaccine.2011.01.065
- Malagón, T., Drolet, M., Boily, M., Franco, E., Jit, M., Brisson, J., & Brisson, M. (2012). Cross-protective efficacy of two human papillomavirus vaccines: A systematic review and



- meta-analysis. *Lancet Infectious Diseases*, 12(10), 781–789.  
[http://dx.doi.org/10.1016/s1473-3099\(12\)70187-1](http://dx.doi.org/10.1016/s1473-3099(12)70187-1)
- Matheson, E., Derouin, A., Gagliano, M., Thompson, J., & Blood-Siegfried, J. (2014). Increasing HPV vaccination series completion rates via text message reminders. *Journal of Pediatric Health Care*, 28(4), e35–e39. doi:10.1016/j.pedhc.2013.09.001
- Ogilvie, G., Remple, V., Marra, F., McNeil, S., Naus, M., & Pielak, K. (2007). Parental intention to have daughters receive the human papillomavirus vaccine. *Canadian Medical Association Journal*, 177(12), 1506–1512. <http://dx.doi.org/10.1503/cmaj.071022>
- Olshen, E., Woods, E., Austin, S., Luskin, M., & Bauchner, H. (2005). Parental acceptance of the human papillomavirus vaccine. *Journal of Adolescent Health*, 37(3), 248–251.  
doi:10.1016/j.jadohealth.2005.05.016
- Owusu-Edusei, K., Chesson, H., Gift, T., Tao, G., Mahajan, R., Ocfemia, M., & Kent, C. (2013). The estimated direct medical cost of selected sexually transmitted infections in the United States, 2008. *Journal of the American Sexually Transmitted Diseases Association*, 40(3), 197–201. <http://dx.doi.org/10.1097/olq.0b013e318285c6d2>.
- Perkins, R., & Clark, J. (2013). Providers' perceptions of parental concerns about HPV vaccination. *Journal of Health Care for the Poor and Underserved*, 24(2), 828–839.  
doi:10.1353/hpu.2013.0080
- Perkins, R. B., Pierre-Joseph, N., Marquez, C., Iloka, S., & Clark, J. A. (2010). Why do low-income minority parents choose human papillomavirus vaccination for their daughters? *Journal of Pediatrics*, 157(4), 617–622.
- Pipe, T. B., Wellik, K. E., Buclida, V. L., Hansen, C. M., & Martyn, D. R. (2005). Implementing evidence-based nursing practice. *Urologic Nursing*, 25(5), 365–370.

- Rand, C., Brill, H., Albertin, C., Humiston, S., Schaffer, S., Shone, L., . . . Szilagyi, P. G. (2014). Effectiveness of centralized text message reminders on human papillomavirus immunization coverage for publicly insured adolescents. *Journal of Adolescent Health, 56*(5), S17–S20. <http://dx.doi.org/10.1016/j.jadohealth.2014.10.273>
- Reiter, P. L., Brewer, N. T., Gottlieb, S. L., McRee, A.L., & Smith, J. S. (2009). Parents' health beliefs and HPV vaccination of their adolescent daughters. *Social Science & Medicine, 69*(3), 475–480. <http://dx.doi.org/10.1016/j.socscimed.2009.05.024>
- Rosenthal, S. L., Rupp, R., Zimet, G. D., Meza, H. M., Loza, M. L., Short, M. B., & Succop, P. A. (2008). Uptake of HPV vaccine: Demographics, sexual history and values, parenting style, and vaccine attitudes. *Journal of Adolescent Health, 43*(3), 239–245. <http://dx.doi.org/10.1016/j.jadohealth.2008.06.009>
- Rosswurm, M. A., & Larrabee, J. H. (2007). A model for change to evidence-based practice. *Journal of Nursing Scholarship, 31*(4), 317–322. <http://dx.doi.org/10.1111/j.1547-5069.1999.tb00510.x>
- Saslow, D., Castle, P. E., Cox, J. T., Davey, D. D., Einstein, M. H., Ferris, D. G., . . . Garcia, F. (2007). American Cancer Society guideline for human papillomavirus (HPV) vaccine use to prevent cervical cancer and its precursors. *CA: A Cancer Journal for Clinicians, 57*(1), 7–28. <http://dx.doi.org/10.3322/canjclin.57.1.7>
- Schiller, J., Castellsagué, X., & Garland, S. (2012). A review of clinical trials of human papillomavirus prophylactic vaccines. *Vaccine, 30*(Suppl.5), F123–F138. <http://dx.doi.org/10.1016/j.vaccine.2012.04.108>
- Stockwell, M., Kharbanda, E., Martinez, R., Lara, M., Vawdrey, D., Natarajan, K., & Rickert, V. (2012). Text4Health: Impact of text message reminder–recalls for pediatric and

- adolescent immunizations. *American Journal of Public Health*, 102(2), e15–e21.  
<http://dx.doi.org/10.2105/ajph.2011.300331>
- Subramanian, S., Trogon, J., Ekwueme, D., Gardner, J., Whitmire, J., & Rao, C. (2010). Cost of cervical cancer treatment: Implications for providing coverage to low-income women under the Medicaid expansion for cancer care. *Women's Health Issues*, 20(6), 400–405.  
<http://dx.doi.org/10.1016/j.whi.2010.07.002>
- Szilagyi, P., Albertin, C., Humiston, S., Rand, C., Schaffer, S., & Brill, H., . . . Stokley, S. (2013). A randomized trial of the effect of centralized reminder/recall on immunizations and preventive care visits for adolescents. *Academic Pediatrics*, 13(3), 204–213.  
<http://dx.doi.org/10.1016/j.acap.2013.01.002>
- U.S. Census Bureau. (2015a, May 29). State & county quickfacts: San Benito (city), Texas.  
Retrieved from <http://quickfacts.census.gov/qfd/states/48/4865036.html>
- U.S. Census Bureau. (2015b, Oct. 14). State & county quickfacts: Harlingen (city), Texas.  
Retrieved from <http://quickfacts.census.gov/qfd/states/48/4832372.html>.
- Waller, J. (2006). Mothers' attitudes towards preventing cervical cancer through human papillomavirus vaccination: A qualitative study. *Cancer Epidemiology Biomarkers & Prevention*, 15(7), 1257–1261. <http://dx.doi.org/10.1158/1055-9965.epi-06-0041>
- Watts, L., Joseph, N., Wallace, M., Rauh-Hain, J., Muzikansky, A., Growdon, W., & del Carmen, M. (2009). HPV vaccine: A comparison of attitudes and behavioral perspectives between Latino and non-Latino women. *Gynecologic Oncology*, 112(3), 577–582.  
<http://dx.doi.org/10.1016/j.ygyno.2008.12.010>
- Wegwarth, O., Kurzenhäuser-Carstens, S., & Gigerenzer, G. (2014). Overcoming the knowledge–behavior gap: The effect of evidence-based HPV vaccination leaflets on

- understanding, intention, and actual vaccination decision. *Vaccine*, 32(12), 1388-1393.  
doi:10.1016/j.vaccine.2013.12.
- Widdice, L., Bernstein, D., Leonard, A., Marsolo, K., & Kahn, J. (2011). Adherence to the HPV vaccine dosing intervals and factors associated with completion of 3 doses. *Pediatrics*, 127(1), 77–84.
- Yeganeh, N., Curtis, D., & Kuo, A. (2010). Factors influencing HPV vaccination status in a Latino population; and parental attitudes towards vaccine mandates. *Vaccine*, 28(25), 4186–4191. <http://dx.doi.org/10.1016/j.vaccine.2010.04.010>
- Ziarnowski, K., Brewer, N., & Weber, B. (2009). Present choices, future outcomes: Anticipated regret and HPV vaccination. *Preventive Medicine*, 48(5), 411–414.  
<http://dx.doi.org/10.1016/j.ypmed.2008.10.006>
- Zimet, G., Rosberger, Z., Fisher, W., Perez, S., & Stupiansky, N. (2013). Beliefs, behaviors and HPV vaccine: Correcting the myths and the misinformation. *Preventive Medicine*, 57(5), 414–418. <http://dx.doi.org/10.1016/j.ypmed.2013.05.013>

## Appendix A

### HPV VACCINATION IMPROVEMENT PROJECT Enrollment Acknowledge Form

Dear Patient/Parent,

This is a quality improvement (QI) project that a Doctor of Nursing Practice (DNP) student is conducting at this clinic from \_\_\_\_ 2015 to \_\_\_\_ 2016 to determine if a text messaging reminder system would have a significant effect on initiating and completing the Human Papilloma Virus (HPV) vaccination series of 3 doses. Please read the acknowledgement, and once you understand and agree to enrollment, sign and date the form. You agree that:

- Once enrolled, you will receive 2 to 3 alerts in the form of text messages through your mobile phone.
  - You will receive text messages only if you have the text messaging feature through your mobile-phone carrier (e.g., AT&T, Verizon, etc.).
  - The clinic or the DNP student will not be responsible for any charges you might incur from your carrier, which will be paid entirely by you.
- Should your mobile phone number change, please update the number with the clinic so your records can be updated.
- The vaccine doses will be determined as recommended by the US Centers for Disease Control's (CDC) Advisory Committee on Immunization Practices (ACIP) guidelines and your allergy history.
- Your personal and private health information records will never leave the clinic, and complete confidentiality will be maintained, as required by HIPAA guidelines and per the clinic's personal information disclosure policies.
- You have the right to withdraw yourself (or your child) from the project at any time.
- You can still be a customer at the clinic and obtain the HPV vaccine doses even if you decide not to enroll or withdraw from the project.

I, \_\_\_\_\_, understand and agree to enroll in this QI project. I understand that I have the right to withdraw myself/ my child from the project anytime.

- Full name of candidate: \_\_\_\_\_
- Signature of candidate (if an adult): \_\_\_\_\_

If candidate is a minor

- Full name of parent: \_\_\_\_\_
- Signature of parent: \_\_\_\_\_

Date: \_\_\_\_\_

**Appendix B**

HPV VACCINATION IMPROVEMENT PROJECT  
Survey

Please complete the following survey questions as truthfully possible. Your answers will be used only to evaluate the outcome of the project.

**1. Counseling**

- a. Did you learn more about the vaccine and its benefit?  
           Yes                      No
- b. Did counseling about the vaccine affect your decision to get vaccinated?  
           Yes                      No

**2. Text Message Reminders**

- a. Did you receive a text message from the clinic reminding you of your appointment?  
           Yes                      No
- b. Was the text message reminder helpful for you in remembering to come for your visit?  
           Yes                      No
- c. Have you received reminders in the form of telephone calls or appointment cards for the HPV vaccine appointments or any previous vaccine or clinic appointments?  
           Yes                      No
- d. Would you prefer text message reminders better than other forms of reminders?  
           Yes                      No

- e. Why did you choose your answer for question 2.d?

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**Thank you very much for taking the time to complete this survey. Please hand this form back to the clinic staff member assisting you during this visit.**

### Appendix C

#### PROYECTO DE MEJORA DE VACUNACIÓN VPH

##### Encuesta

Por favor complete las siguientes preguntas de la encuesta la verdad posible. Sus respuestas se utilizarán para evaluar el resultado del proyecto.

#### 1. Consejería

- a. ¿Aprendiste más sobre la vacuna y sus beneficios?  
       Si                      No
- b. ¿Hizo de asesoramiento sobre el efecto de la vacuna contra la decisión de vacunarse?  
       Si                      No

#### 2. Recordatorios de mensaje de texto

- a. ¿Ha recibido un mensaje de texto de la clínica de recordarle de su cita?  
       Si                      No
- b. ¿Fue el aviso de mensaje de texto útil para ti en recuerdo a su visita?  
       Si                      No
- c. ¿Ha recibido recordatorios en forma de llamadas telefónicas o cartas de nombramiento para las citas de la vacuna de VPH o cualquier vacuna anterior o citas de la clínica?  
       Si                      No
- d. ¿Preferiría mejor que otras formas de recordatorios de mensaje de texto?  
       Si                      No
- e. Por qué elegiste tu respuesta para la pregunta “2. ¿d”?

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**Muchas gracias por tomarse el tiempo para completar esta encuesta. Por favor, mano esta forma volver al miembro del personal del clínica que le ayudó durante esta visita.**