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Running head: A STRATEGY TO INCREASE VACCINATION RATES OF HPV

A Strategy to Increase Vaccination Rates of Human Papilloma Virus in Adolescents

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### Abstract

Human Papillomavirus (HPV) is a growing concern in the world today with extraordinary infection rates. Research investigating immunization rates and reasons adolescents do not get vaccinated is thoroughly reviewed by the scholarly community. However, research regarding the methods to increase HPV vaccination rates are lacking. This literature review examines the effects that text message reminders have on vaccination uptake of the human papillomavirus in adolescents. The basis of this literature review was determined from an outpatient case study of a 20-year-old female who presented in a college university clinic setting to receive oral contraceptives but was found to not have adequate vaccination against HPV. College students tend to have high risk sexual behaviors that increase HPV infection rates. This attributed to the systematic search to determine that text messaging does have a positive outcome in vaccine uptake. The search was conducted with two different databases including Cumulative Index to Nursing and Allied Health Literature (CINAHL) and PubMed focusing on studies completed within the last ten years. The majority of the relevant articles obtained were randomized controlled trials, all of which proved that text message reminders for vaccinations increase immunization uptake. Specificity related to the adolescent population was scarce and research of different age groups as well as different types of immunizations were further explored and compared to adolescents and the HPV vaccination.

*Keywords:* adolescent, human papillomavirus, immunization, uptake, vaccination

### A Strategy to Increase Vaccination Rates of Human Papilloma Virus in Adolescents

Over the last 10 years, society has seen a vast increase in technology use. Healthcare providers of today need to use technology as an advantage and implement it into their plans of care for their patient population. This has been done so in a number of ways such as computer charting, patient access to personal health information via internet, and patient educational resources. Technology can also have a negative impact by influencing patient decisions through social media or false education. An example of this is the false accusation of immunizations causing autism which has effected immunization rates. Therefore, providers need to ensure that they are using technology to their practical advantage and eliminating biased information to ensure vaccinations continue to be given. This review of literature will discuss a technology strategy that providers can use to increase Human Papillomavirus (HPV) vaccinations in their practice as related to the case study of interest.

HPV is a rapidly growing sexually transmitted infectious disease that is most preventable through vaccination. It is the most common sexually transmitted infection (STI) and will infect almost every sexually active person at one point in their life (Centers for Disease Control and Prevention (CDC), 2015). HPV consists of more than 200 viruses, over 40 of which are spread through direct contact with infected mucous membranes either vaginally, anally, or through oral sex (National Cancer Institute, 2015). HPV types 16 and 18 are considered high-risk oncogenic HPV infections that can cause cervical, penile, vulvar, vaginal, anal, and oropharyngeal cancers, while HPV types 6 and 11 are low-risk infections causing genital warts and respiratory papillomatosis (CDC, 2015). There are 79 million Americans currently infected with HPV that could have been prevented through vaccination (CDC, 2015). About 360,000 people in the

United States (U.S.) contract genital warts each year and more than 11,000 women in the U.S. are diagnosed with cervical cancer related to HPV (CDC,2015).

HPV vaccination coverage continues to be low amongst adolescent populations. There are three different vaccines available: bivalent (Cervarix), quadrivalent (Gardasil), and 9-valent (Gardasil 9), which all protecting against HPV 16 and 18 (CDC, 2015). Gardasil 9 also covers five different types of HPV viruses that cause about 15% of cervical cancers and, along with Gardasil, they protect against HPV 6 and 11 (CDC, 2015). National vaccine coverage for adolescents in 2014 for one or more HPV vaccinations was 33.6% - 41.7% compared to tetanus-diphtheria-acellular pertussis (Tdap) vaccine coverage which was 84.7% - 87.6% (Reagan-Steiner et al., 2015).

However, the HPV vaccination remains to be a three stage series and requires completion of all three injections in order to have coverage from the HPV infection. In 2014 through a national survey, 60% of girls 13-17 years old received at least 1 dose of the HPV series, whereas only 40% received all 3 doses of HPV vaccine (Reagan-Steiner et al., 2015). The national survey results indicated even lower rates of vaccine uptake among boys aged 13-17 years; 42% receiving at least 1 dose and only 22% received all three doses in the series (Reagan-Steiner et al., 2015). The knowledge of these results indicate the need of provider reassurance in order to increase vaccine uptake. Thus, resulting in strategies to get adolescents to see their healthcare provider so that they can be educated about vaccines with the hopes of being vaccinated against HPV prior to high risk sexual behavior as such exemplified in the following case.

### **Case Report**

For the purpose of anonymity in this case report the patient will be called Katie. Katie is a 20-year-old female who presented to her university's clinic on February, 5<sup>th</sup> 2016 with the

request to start birth control. She thinks birth control will be a good thing for her in order to prevent pregnancy. She has been sexually active for about three years now with multiple partners and has only used condoms to prevent pregnancy and STIs. She is new to the clinic but received previous healthcare at a clinic in her hometown within the last year. She feels overall healthy with no other concerns. No history or physical information was on file for this patient and was all obtained during this visit.

### **History**

This patient has a past history of a urinary tract infection (UTI) but no past surgical history. Katie has an allergy to penicillin and the only medications she takes are a multivitamin and Xenadrine. She stated that her immunizations were up-to-date but when asked about the HPV vaccine she reported no history of ever receiving it. Since she has been sexually active for the past three years with multiple partners, she is at risk for contracting STIs such as HPV despite 'regular' condom use. Having had a regular history of checkups with her hometown provider it would be easy to assume and miss the opportunity to question or educate her about the HPV vaccination. Her family history was thoroughly discussed resulting in the discovery that her dad having had a blood clot and her mom having had a lumpectomy in the past. Her dad's blood clot was related to a past accident which rules out the need to investigate it any further. This does not put the patient at risk for any hereditary blood clot disorders that would contraindicate oral contraception (OCP) use. Her mother's lumpectomy was determined to be non-cancerous. Any past family history of breast cancer would concern a provider in regards to increased risk of breast cancer with the use of OCPs. She is a good student, eats right, exercises, and has regular water intake. She denied any recreational drug use and does not smoke or use

smokeless tobacco. Katie occasionally consumes alcohol consisting of two to three drinks per week.

### **Review of Systems**

During her exam a review of systems was completed with no indication of any abnormalities. She has had no changes in her daily life and strives to lead a healthy lifestyle with exercise, balanced diet and good water intake. Katie denied any weight loss or weight gain and verbalized that she took Xenadrine to stay thin. She has regular menstrual cycles with no abnormal bleeding or cramping. The last time she was sexually active was around New Years. This first day of her last menstrual cycle was at the end of January and she has not been sexually active since then. She denied any past history of OCP use or emergency contraception. Katie states that she has never had a pap smear nor been tested for STIs. She does not have any indications of infection at this time and continues to have normal vaginal discharge. She has had no polyuria, dysuria, or hematuria that could indicate a current UTI.

### **Physical Exam**

Her vital signs were taken at the beginning of the appointment and reveal a blood pressure of 122/74 mmHg, a pulse of 82 beats per minute, temperature of 98.5 degrees Fahrenheit, 18 respirations per minute, a height of five foot seven inches, and a weight of 110 pounds. The vital signs are normal except for her height and weight. Katie's body mass index indicates that she is 17.2 which is considered to be underweight (National Heart, Lung, and Blood Institute, 2016). This measurement is concerning as she would indicate no need to continue use of a weight loss supplement such as Xenadrine. Katie's lung sounds were unremarkable and clear throughout her fields. She had a normal heart rate and rhythm with audible S1 and S2. Her physical exam otherwise indicated to be normal.



### **Management of Care**

Katie has had an overall normal exam and her management of care will focus on safe sex practices and pregnancy prevention. Due to her past medical and sexual history, it would be appropriate to obtain a urine sample to check for STIs, UTI, and to rule out pregnancy. Katie's results were negative. Since her history and physical were negative for any contraindications of OCP use, she can be started on a monophasic birth control pill. She was also educated on safe sex practices including correct condom use and a recommendation for the HPV vaccine. At the age of 21 she will need to start to get regular pap smears every three years. She was recommended to stop the use of Xenadrine due to her low BMI. She could follow up in the clinic in three months to monitor her OCP use and to check for any adverse effects.

Katie's case study shows that a routine visit for a specific request can turn into an opportunity for a healthcare provider to provide thorough education, update vaccinations, and prevent unwanted complications. If Katie had not been seen, she could have ended up with adverse outcomes such as unwanted pregnancy, continued unsafe sex practices, HPV or other STIs. Thus, it is the responsibility of the provider to include preventative practice with each visit and to ensure that each patient is educated to the fullest.

### **Literature Review**

#### **Search Strategies**

The purpose of this literature review was to determine a strategy that providers could use to increase vaccination rates of HPV in adolescents. As previously described, technology is the basis of our advancing world, making it a major part of each person's life and therefore, should be used to the provider's advantage. Katie is a 20-year-old college student that has access to a cell phone and uses text messaging on a daily basis. Therefore, the main priority of the search

strategy focused on how text messaging can increase vaccination rates by sending reminders to the patient or guardian encouraging them to come into the clinic to get vaccinated.

The review was initiated with an electronic search in order to obtain relevant literature related to the topic of choice. The search engines used were obtained through student access at the University of North Dakota Harley French Library of the Health Sciences website. Two search engines were used including Cumulative Index to Nursing and Allied Health Literature (CINAHL) and PubMed.

The first search engine used was CINAHL in which “vaccination” AND “text message” were used in the search fields. This initial search yielded 15 results, 14 of which were publications in the last ten years. Five of the articles were determined to be appropriate literature for the clinical topic. Other search terms were included such as: human papillomavirus, HPV, vaccine, text, message, and messaging. All of these terms yielded similar results narrowing the search.

The second search engine used was PubMed. The initial search keywords were “text messaging immunization” along with a limited search to studies published within the last ten years. This search provided 58 results. Many of the titles in the results were similar to the CINAHL search and were quickly excluded. Based off of the remaining results, the articles were reviewed by their titles, level of research, and interest related to the research objective. It was determined that three more articles were clinically relevant.

Not every article was available through online viewing. Those articles were then requested through Interlibrary Loan through the University of North Dakota. Two more articles were obtained through a review of article references and were then searched directly by their title through CINAHL or PubMed. The literature search resulted in a total of 10 articles.

### **Influenza Vaccines**

Three articles were obtained related to influenza vaccinations and text messaging. As vaccination uptake remains the primary goal in the presented case, it was determined that influenza immunization could be related to HPV vaccination in similar instances of text message cues/reminders to encourage uptake. Influenza along with HPV is a preventable infection with appropriate immunization.

Stockwell et al. (2012) completed a randomized controlled trial targeting 9212 children of low-income families in New York City, New York (NYC, NY) ranging from ages six months to 18 years in four separate clinics during the 2010-2011 influenza season to encourage them to get vaccinated through text messaging intervention. Of those children, 7574 had not yet received an influenza vaccination (Stockwell et al., 2012). In this study the randomized samples in the intervention group consisted of 4607 children that received one influenza text message reminders a week for five weeks ranging from education about the influenza vaccination to locations of vaccination clinics (Stockwell et al., 2012). Each text was either sent to a guardian of the child or adolescent in the intervention group (Stockwell et al., 2012). Personalization of language preferences were included along with each text message being sent with a staggered approach to avoid excessive text message volumes (Stockwell et al., 2012). Each participant had the opportunity to opt out at any time and the text messages were discontinued once the child was immunized (Stockwell et al., 2012). Overall, more than 23,000 text messages were sent to the 4607 children in the intervention group with 513 indicated as undeliverable (Stockwell et al., 2012). In comparison the children in the intervention group receiving the text message reminders to get the influenza vaccine were 43.6% compared to the standard of care group at 39.9% indicating a 3.7% difference in vaccination uptake (Stockwell et al., 2012).

In comparison, another study was completed by Stockwell et al. (2015) in NYC, NY during the 2012-2013 influenza season. This study targeted guardians of children 6 months through 8 years of age that had already been given their primary dose of influenza vaccine and required a second dose (Stockwell et al., 2015). Through a randomized controlled trial, Stockwell et al. (2015) recruited participants during the initial influenza vaccination in three different community clinics primarily serving a Latino population. “A total of 726 families were eligible among 887 screened who were in need of a second dose of influenza vaccine, and 662 were randomly assigned; two participants were found to be ineligible to receive a second dose immediately after randomization but before messages were sent; they were removed” (Stockwell et al., 2015, p. e85). Once again this study catered to the preferred language to ensure health literacy and avoid racial bias (Stockwell et al., 2015). Each child was randomly assigned to either the educational text message group, conventional text message group, or written reminders (Stockwell et al., 2015). The educational group received messages and updates explaining the importance of the second dose as well as the importance of timely vaccination (Stockwell et al., 2015). This is in comparison to the other two groups which simply indicated that the child was due for a vaccination (Stockwell et al., 2015). As expected, the results indicated that the education group were more likely to receive the second dose in a timely manner at 72.7% compared to the conventional group at 66.7% and the written reminder group at 57.1% (Stockwell et al., 2015). This supports the argument that text message reminders can increase influenza vaccination.

In a third study by Stockwell et al. (2014) titled “Influenza Vaccine Text Message Reminders for Urban, Low-Income Pregnant Women,” they completed a randomized controlled trial including women who were partaking in prenatal care at community-based clinics in NYC,

NY during the 2011-2012 influenza season. Women were eligible if their first trimester obstetric visit was between February 1<sup>st</sup> and August 15<sup>th</sup>, 2011, had an estimated due date after August 31<sup>st</sup> of 2011, and had a cell phone number on file (Stockwell et al., 2014). After exclusion was completed, 1153 women were able to participate and were divided into an intervention group and a control group (Stockwell et al., 2014). “Women in both groups received routine automated telephone pre- and postnatal appointment reminders provided directly from the clinic network” (Stockwell et al., 2014, e8). The intervention group received supplemental five weekly text messages including an introductory message, three educational messages, and a final interactive message (Stockwell et al., 2014). By December 31<sup>st</sup> 2011, 61.9% of women in the intervention group received an influenza vaccine compared to 49% in the control group (Stockwell et al., 2014). This resulted in positive outcomes related to influenza vaccine uptake from education text messages.

These three studies provided information on the influence that text messaging can have on the influenza vaccine uptake. Each article was a randomized controlled trial that took place in NYC, NY with similar authors and effective studies. One of the biggest limitations of these studies were the bias that provider education could have had on influencing immunization uptake. Nonetheless, with these studies we were able to see the benefit that text message reminders have on different populations ranging from 6 months of age into adulthood along with consecutive influenza seasons between 2010 and 2013.

### **Immunizations**

Three articles were obtained for critical analysis and review related to text message reminders and the impact that it has on adolescent immunizations. These studies were not limited

to a specific immunization, but rather, were targeted to promote general vaccination uptake. This is in hopes that adolescents' immunization status would be up-to-date.

Stockwell et al. (2012) completed yet another study on the impact that text messaging has on immunizations of pediatrics and adolescents in low-income, minority populations of NYC, NY. This study was conducted with two independent randomized controlled trials between January 2009 and June 2009 (Stockwell et al., 2012). The first study was initiated in January 2009 and completed April 2009 with adolescent age and gender controls (Stockwell et al., 2012). "The purpose was to assess the effect of text messaging on receipt of 1 or both of 2 routinely recommended adolescent vaccines: meningococcal (MCV) and tetanus-diphtheria-acellular pertussis (Tdap)" (Stockwell et al., 2012, p. e15). The parents or guardians of the adolescents were randomly selected into groups with the intervention group consisting of 195 people receiving text message reminders for vaccination at weeks 1, 2, 3, 6, and 7 (Stockwell et al., 2012). The results of the adolescent study showed that more adolescents in the intervention group received either one vaccination or both of the MCV and Tdap at the end of week four (14.5% vs 4.2% control group), 12 (26.7% vs 13.9%) and 24 (36.4% vs 18.1%) (Stockwell et al., 2012). The second randomized controlled trial was completed between May and June 2009 amongst pediatric guardians and parents to assess the effect that text messaging reminders have on immunization of the *Haemophilus influenza* B (Hib) series (Stockwell et al., 2012). "Two weeks before the sessions, parents were randomized to receive a paper mailing alone or a paper mailing plus up to 3 text message notifications" (Stockwell et al., 2012, p. e16). The intervention group consisted of 87 families receiving reminders by paper mailing as well as the text messages (Stockwell et al., 2012). The control group consisted of 87 families receiving only the paper mailed reminder (Stockwell et al., 2012). "Text messages and letters notified parents that their

child was in need of a Hib vaccine because of a shortage and included the location, times, and dates of the special immunization session” (Stockwell et al., 2012, p. e16). As expected, parents who received both reminders vaccinated their children 21.8% compared to 9.2% of parents who only received the mailed reminder (Stockwell et al., 2012). Both trials indicated higher vaccination rates with the text message reminders.

A study completed by Bar-Shain, Stager, Runkle, Leon, and Kaelber (2015) took into consideration three different routes of direct messaging to improve adolescent immunizations including automated voice messages, text messaging, and postcards. This study was completed through a public health care system in Northeast Ohio including adolescents 11 to 18 years of age with a history of at least one encounter with a primary care provider and in need of an HPV, MCV, or Tdap vaccination (Bar-Shain et al., 2015). They used a stepwise approach to determine the method of messaging through information collected from 3,393 eligible electronic health records:

If an e-mail address was available, an e-mail was sent. If no e-mail address was available, phone numbers were examined by the telecommunications vendor to determine if they could receive text messages. If any of the available phone numbers for a patient were capable of receiving a text message, a text message was sent. If none of the available phone numbers could receive a text message, an auto- mated recorded voice message was delivered. If no working phone numbers were available, a postcard was sent. (Bar-Shain et al., 2015, p. S22)

Overall, there were a total of 7,094 messages sent; 47% were voice messages, 37% were text messages, and 16% were postcards (Bar-Shain et al., 2015). Only 10 email addresses were on file and therefore, thrown out of the study due to low numbers (Bar-Shain et al., 2015). The

study sent out messages every two months for patients needing at least one vaccination for up to 3 messages (Bar-Shain, 2015). “Within 24 weeks of the first contact, a total of 1,324 vaccines (745 HPV, 403 MCV, and 176 Tdap) were given to study patients in 959 visits” (Bar-Shain et al., 2015, p. S24). Leaving one message provided a vaccination rate of 38.8% and proved to be more effective than two or three messages (19.4% and 24.1%) (Bar-Shain et al., 2015). Phone calls showed to be the least effective at 31.5% compared to 38.8% vaccination rate with text messaging and 40.1% with postcards (Bar-Shain et al., 2015). The results of one message having better vaccination rates than two or three messages is not expected. This could attribute to the fact that a single postcard given was more effective than the multiple phone calls or text messages.

In an article by Morris, Wang, Wang, Peddecord, and Sawyer (2015) titled “Comparison of Reminder Methods in Selected Adolescents with Records in an Immunization Registry,” they completed a randomized controlled trial assessing the effectiveness mailed (n = 282), e-mailed (n=963), or text messaging (n=552) reminders have on improving vaccination rates. They selected patients through a computer-based program randomly selecting records of adolescents aged 11 – 17 years from the San Diego County Immunization Registry that were not up-to-date (UTD) on vaccinations according to their records (Morris et al., 2015). The participants selected were first contacted via phone call to ensure participation and consent (Morris et al., 2015). Three reminder phases were initiated to the parents or guardians of the adolescents (Morris et al., 2015). The first phase initiated a reminder two weeks after the participation phone call, followed by another two messages that were two weeks apart three months later if the patient did not become UTD with their vaccinations (Morris et al., 2015). The final phase of the last two reminders, again, were sent two weeks apart three months after the second phase of reminders



(Morris et al., 2015). By the end of the study, UTD status of the adolescents were reached by 32.1% of the text message group, 23% of the postcard group, 20.8% of the e-mail group, compared to only 9.7% of the nonintervention group (Morris et al., 2015). Unlike the prior study, this study showed that the text message group proved to be more effective in vaccination uptake than the postcards.

After the review of literature for a variety of immunizations aiming to achieve an up-to-date immunization status, it is apparent that reminder interventions prove to be effective in promoting uptake. In the Stockwell et al. (2012) study they did not include the HPV and influenza vaccines in their outcomes due to parental or provider attitudes and beliefs. Low-income and race did not show to have an influence on text messaging availability in these studies but limitations persist for provider influences over patients. General vaccination uptake is just as important as HPV vaccination uptake and therefore, strategies used with other immunizations could be modified to be used with the three stage HPV vaccination series.

### **HPV Vaccination**

Four different articles were obtained with specific information relating text message reminder effectiveness to HPV vaccination uptake. These articles were of particular interest as they were most relatable to the above case study. HPV remains foremost preventable with vaccination and can be achieved more readily with text message reminders as proven by the following review of studies.

A randomized controlled trial of text message reminders for the HPV vaccination was completed by Rand et al. (2015) targeting parents of publicly insured adolescents aged 11-16 years with no previous HPV vaccinations. This study was completed at Monroe Plan for Medical Care in New York from July 2013 to March 2014 (Rand et al., 2015). A total of 39 primary care

practices with more than 175 adolescents were enrolled in the intervention group (Rand et al., 2015). Text messages were then sent to the adolescents' parent's who were eligible to receive the vaccine followed by the second and third dose of the series (Rand et al., 2015). The control group parents received messages at the same time but with a control message about general adolescent health and not the vaccination (Rand et al., 2015). The big limitation of this study was that over half of the participants had undelivered messages (Rand et al., 2015). The results concluded that the initial HPV dose was 13% for the control group compared to 16% for the intervention group (Rand et al., 2015). This shows that the text message reminders about the HPV vaccination was indeed beneficial for vaccination uptake. The percentages are mostly due to the fact that the HPV vaccination requires three different injections in order for completion of the series.

Matheson, Derouin, Gagliano, Thompson, and Blood-Siegfried (2014) conducted a quality improvement project to see if sending text message reminders to the guardians or patients of a pediatric urban clinic setting would help to promote uptake of the HPV vaccination series. This study was completed in a North Carolina clinic with input from the clinic staff for the immunization reminders along with education on the study process (Matheson et al., 2014). They followed the clinics standard of practice for the HPV vaccine in which males or females ages 11 to 22 years (n=37) could receive the vaccine (Matheson et al., 2014). The process of initiation was as follows:

During clinic visits for eligible patients, clinical staff provided patients and parents with an HPV vaccine information sheet. Providers discussed HPV infection and the HPV vaccine with patients and parents. If the family initiated the vaccine, the text message reminder opportunity and enrollment sheet was offered. (Matheson et al., 2014, p. e37)

Once the first HPV vaccine was initiated, dates were set up for the second and third HPV doses (Matheson et al., 2014). A reminder was texted seven days before the next dose, on the day the dose was due and then again seven days after the dose was due if the vaccine was not administered (Matheson et al., 2014). The results concluded that in the intervention group (n=37) 14% completed the HPV vaccination series compared to 0% in the interest group (n=43) (Matheson et al., 2014). These results are very interesting as the HPV series did not get completed in the group without the intervention of text messaging.

Kharbanda et al. (2011) completed a comparative study with an intervention group and two control groups aiming to prove that text message reminders have a beneficial effect on completion of the HPV vaccination series. The study took place in nine different pediatric clinics in NYC with no previous use of reminders for the HPV vaccination (Kharbanda et al., 2011). Text message reminders were implemented January – June 2009 in which all adolescent girls 9-20 years of age that received either the HPV1 or HPV2 vaccine were included and offered to participate in the text message reminders (Kharbanda et al., 2011). Parents of adolescents or adults 18-20 years could enroll in the program to receive three weekly reminders stating they were due for their next vaccine based off of administration guidelines (Kharbanda et al., 2011). The text message intervention group was compared to two control groups (Kharbanda et al., 2011). One control group was made up of the patients that chose to opt out of the text messages and the other group were patients that had already received HPV1 or HPV2 during January 2009 to June 2009 but did not make the intervention deadline (Kharbanda et al., 2011). Overall, 434 patients were offered enrollment to receive text messages while only 124 of them activated the text message reminders (Kharbanda et al., 2011). The intervention group that received text messages received their next HPV vaccine on time at 51.6% compared to 35% of the first control

group whom opted out of the text message intervention and 38.1% that were historical representation (Kharbanda et al., 2011). These results indicated a 13.5% difference between those that received text messages to those of the general public without intervention.

Aragones, Bruno, Ehrenberg, Tonda-Salcedo, and Gany (2015) lead a nonequivalent group study focusing on HPV vaccine-eligible children of Mexican parents in NYC in 2012-2013. “Between December 2012 and May 2013 all those who attended the Health Window at the Consulate General of Mexico in New York City were approached consecutively to assess their eligibility to the study using a standardized intake form and to obtain consent to participate” (Aragones et al., 2015, p. 555). Participants needed to be a parent age 18 years or older, of Mexican descent, with Spanish as the primary language, with guardianship of a child ages 9-17 years who have not received the HPV vaccine and have a cell phone with text messaging services (Aragones et al., 2015). This study involved two different interventions. The first intervention was a parental education session on HPV, the HPV vaccine, and any questions the parents had (Aragones et al., 2015). The second intervention involved text messaging initiated one week after the education session in which 45 participants received a text message once a week reminding them that their child should get vaccinated (Aragones et al., 2015). These messages continued until the child received the HPV1 vaccine or for a duration of up to six weeks (Aragones et al., 2015). If the adolescent received their first dose then texts were sent for the HPV2 starting a month prior to when the second dose was due (Aragones et al., 2015). Weekly text messages were sent for a duration of eight weeks or until the HPV2 vaccine was administered (Aragones et al., 2015). This continued to be the same process for the third and final HPV dose (Aragones et al., 2015). By the end of the study, 98% of parents who partook in the educational session as well as the text messages reported that their child received the first

dose of HPV and 88% completed the entire HPV series (Aragones et al., 2015). Comparatively, only 87% of the educational group received just the first dose and only 40% received all three doses (Aragones et al., 2015).

Text messaging reminders initiated with the influenza vaccine, HPV vaccine, and other immunizations prove to be an effective method to promote vaccine uptake. The majority of the studies reviewed had similar limitations including: multiple languages, limited participation, a required opt-out feature, and most of all, the influential physician or parental belief or attitude towards the vaccination itself. Most of these studies were completed in New York but showed that low-income or race did not play a major factor in whether text messaging was available or not.

### **Learning Points**

The review of literature provided an effective strategy that providers can use in their clinic setting in order to promote vaccine uptake. If Katie or her parents had the opportunity to receive text message reminders during her adolescence, it is likely that she would have already been vaccinated against HPV. However, it also became apparent that healthcare providers can be very influential on the decisions their patients make. Some of the key points and findings related to this research are:

- Sending reminders in regards to vaccinations, whether it is an HPV vaccination or not, proves to be a beneficial to improve vaccination rates.
- Healthcare providers are ultimately the primary source of information and education for adolescent vaccinations and thus, need to provide thorough education regarding risks and benefits of vaccination and eliminate biased perceptions of vaccinations.

- Parents are largely the most influential factors in an adolescent's life and therefore, need to remain the targeted population for adolescent vaccination uptake.
- HPV is a preventable disease that can be successfully reduced through appropriate immunization.

Healthcare providers are patient advocates and aim to provide thorough and holistic care. In a case such as Katie's, she entered the clinic in search for one thing, birth control. However, by the end of the visit after a thorough provider examination, Katie was educated on a number of topics and was provided the opportunity to avoid the negative implications from the HPV virus through encouragement of the HPV vaccination.

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