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The document mentioned above has been reviewed and accepted by the student's advisor, on behalf of the advisory committee, and by the Assistant Dean for MSN and DNP Studies, on behalf of the program; we verify that this is the final, approved version of the student's DNP Project including all changes required by the advisory committee. The undersigned agree to abide by the statements above.

Hayden Kelley, Student

Dr. Elizabeth Tovar, Advisor

DNP Final Project Report

The Use of Magnets as Patient Appointment Reminders and HPV Vaccination Rates

Hayden Kelley

University of Kentucky

College of Nursing

Spring, 2017

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Dedication

This work and my DNP Project are dedicated to my family and friends who have loved and supported me throughout this journey. To my mother who has been by my cheerleader and rock since day one and my father who knows exactly the words I need to hear to relight the flame when times seem to be at their darkest. This is for you both.

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Abstract

PURPOSE: The purpose of this study is to evaluate the effectiveness of a patient reminder alert system implemented at a public health department in rural Indiana in an attempt to increase the facility's human papillomavirus (HPV) vaccination rates.

METHODS: This study was a secondary data analysis utilizing the Children and Hoosiers Immunization Registry Program (CHIRP) database to compare HPV vaccination rates before and after the implementation of an HPV magnet reminder program. The sample consisted of 122 adolescents; 31 patients for the pre-implementation period, July 1, 2015- June 30, 2016 and 91 patients for the post-implementation period, July 1, 2016- Jan 31, 2017.

RESULTS: There was a significant increase in the percent of patients receiving dose 2 of the three-part HPV vaccine series following the magnet program intervention (19% pre vs. 42% post; $p=.025$).

CONCLUSION: The facility's HPV dose 2 vaccination rates significantly increased in all demographics after the implementation of a magnet program. This study demonstrates that the use of magnets as patient appointment reminders has been shown to be an effective strategy in increasing HPV vaccination return rates.

Background

Worldwide, cervical cancer is the third most common cancer among women and the second most frequent cause of cancer-related death, accounting for nearly 300,000 deaths annually (Centers for Disease Control and Prevention [CDC], 2016). In 2013, over 4,000 of the nearly 12,000 women who were diagnosed with cervical cancer in the United States died from the disease (CDC, 2016). Despite the fact that the human papillomavirus (HPV) vaccine is 98% effective in preventing cervical precancerous cells associated with specified types of HPV, vaccination coverage remains low in adolescents in the United States (CDC, 2016).

In 2014, 43% of adolescent males in Indiana had received the first dose of the HPV vaccine with 27% completing the series compared to 54% of adolescent females beginning the series and only 31% of Indiana females completing the three-part vaccine series (CDC, 2016). For both males and females in the state of Indiana, the vaccination rates are far from the CDC's target goal of 80% completion. There is a subsequent decline in rates of the vaccine series, with completion rates being substantially lower than initiation rates. A national survey conducted in 2015 found this to be consistent across states with a national average of 42% for females and 28% for males who completed the HPV vaccine series compared to 63% of females and 50% of males initiating the vaccine series (CDC, 2016).

Healthcare providers across the country are seeking evidence-based strategies to improve HPV vaccination rates. As patient compliance declines with each subsequent dose of the three-part series, interventions are aimed at improving return rates for patient follow-up appointments. Many researchers have found reminder alert systems to be effective in this challenging endeavor (JAMA, 2016). Reminder alert systems such as: postcards, text messages, magnets, emails, or

phone calls are relatively inexpensive and have been linked to improved completion rates of the three-part vaccine series (Mofunanya, 2011; Vargas et al., 2013; Bar-Shain et al., 2015; Preciado et al., 2015). The creator of the HPV vaccine, MERCK pharmaceuticals, was the first to utilize magnets as patient appointment reminders and encouraged their distribution in health clinics in an attempt to increase HPV vaccination rates (MERCK, 2017).

Purpose

A systematic review of current research found lack of provider education and recommendation for the vaccine, concerns about vaccine costs, and the requirement of three separate doses given over a minimum of 6 months to be the major barriers to HPV vaccination (Holman et al., 2014). Due to the fact that many parents whose children start the HPV vaccine series may forget or might not have been informed that their child needs to receive three separate doses of the vaccine; current evidence supports the use of patient reminder alert systems to improve return and completion rates of the HPV vaccine series (Hansen & Niccolai, 2016).

On July 1, 2016 at health department in rural, Indiana implemented a magnet program which used magnets as patient appointment reminders in an attempt to increase follow-up appointment rates and ultimately improve series completion rate. Due to time constraints in this study, data only evaluated return rates for dose two of the three-part vaccine series. The magnet program ran from July 1, 2016 to December 31, 2016. The purpose of this research study was to evaluate the effectiveness of the Magnet Program on HPV vaccination return rates for dose 2 of the three-part vaccine series put in place by this facility. Pre- and post- magnet program intervention vaccination rates were examined.

The specific aims of this study include:

1. Compare 2nd dose vaccination rates before and after the initiation of the magnet program

2. Examine gender and age differences in the rates of return for shot two pre- and post-magnet program implementation.

Methods

This study was conducted through a secondary data analysis utilizing the Children and Hoosiers Immunization Registry Program (CHIRP) database to compare HPV vaccination rates for dose 2 of the three-part vaccine series before and after the implementation of an HPV magnet reminder program. The Gibson County Health Department began vaccinating males as well as females aged 11 to 18 years against the human papillomavirus in January of 2015. They found their clinic's HPV vaccination rates continued to fall short of the facility's goal to have 92% of all adolescent patients complete the HPV vaccine series. This goal, set by the Indiana State Department of Health, applies to all Indiana health departments participating in the Vaccines for Children program; and is significantly higher than the CDC's target goal of 80%.

On July 1, 2016 the health department implemented a magnet program which utilized magnets as patient appointment reminders in an attempt to increase follow-up appointment rates and ultimately to increase completion rates of the vaccine series. Magnets were to be dispensed to all patients aged 11 to 18 years who received the first dose of the HPV vaccine at the Gibson County Health Department. The magnets replaced the patient appointment reminder cards which were previously distributed. Each magnet had the appointment date and time of their next shot written on it. Magnets were to be dispensed from July 1, 2016 until December 31, 2016. Data were collected January 3, 2017 to evaluate the effectiveness of the magnet program on the clinic's HPV vaccination rates for shots one and two of the three-part vaccine series. Vaccine completion rates were not collected due to the limited time frame of study.

Setting

This study was conducted at a health department is located in rural, Indiana. This state-run health center resides in the southwestern region of Indiana. With a population of fewer than 35,000 people, of which 70% utilize Medicaid and are eligible for the Vaccines for Children program, the Gibson County Health Department strives to provide routine health maintenance regardless of ability to pay to an estimated 3,000 patients annually.

Sample

The study population for this project includes data from all adolescents, males and females, aged 11 to 18 years who received the first dose of the HPV vaccine at the Gibson County Health Department after July 1, 2016. The sample was collected from the CHIRP database. This population was necessary as the Centers for Disease Control and Prevention recommend the human Papillomavirus vaccine for all adolescents starting at age 11 years in attempt to complete the vaccine series before being exposed to the virus during sexual intercourse (CDC, 2015). All charts of patients aged 11-18 years who received the first dose of the HPV vaccine from July 1, 2016 to December 31, 2016 at the Gibson County Health department were reviewed; this included 92 charts. Those excluded from the project were children under the age of 11 years, adolescents over the age of 18 years, and those who did not meet the CDC's eligibility criteria to receive the HPV vaccine. Adolescents who were ineligible to receive the HPV vaccine included those who have had a serious or life-threatening allergy to any component of the HPV vaccine (CDC, 2015).

Data Collection

Approvals from an Institutional Review Board (IRB) and the health department administration were obtained prior to the collection of data. This study was based on a secondary

data analysis utilizing the Children and Hoosiers Immunization Registry Program (CHIRP) database. A waiver of informed consent was granted from the University of Kentucky Institutional Review Board. Please refer to Appendix A for a list of variables that were reviewed, which included demographic variables (age, ethnicity, sex) and outcome variables (received shot 2, or did not receive shot 2).

Data Analysis

Descriptive statistics (means and standard deviation or frequency distributions) were used to summarize the demographic characteristics of patients. The independent samples t-test, chi-square test of association or Fisher's Exact, as appropriate, compared the demographic characteristics between the pre- and post- magnet program intervention groups. The proportion of patients receiving the second dose of the HPV vaccine was compared using the chi-square test of association. Data analysis was conducted using SAS, version 9.4; an alpha level of .05 was used throughout to determine significance.

Results

Sample Characteristics

The total sample included 122 adolescents; 31 prior to the implementation of the magnet program and 91 post- magnet program intervention. In the total sample, the average age was 14.7 years (SD=2.3). Slightly more than half of the patients (56%) were female. There were no significant differences in age or sex between the two samples; however, there were significantly more Hispanics in the post-intervention sample ($p=.04$).

Vaccination Rates

To assess return rates for shot two of the three-part HPV vaccine series in both the pre- and post- magnet program implementation groups, vaccine information was collected utilizing

the Children and Hoosiers Immunization Registry Program (CHIRP) database. Patients in the two groups were categorized based on sex (male or female) and then placed in sub-categories based on ethnicity (Caucasian, African American, or Hispanic; see Table 1).

The vaccination rates for dose two of the HPV series were significantly higher in the post- magnet program implementation group ($P=.025$) with a return rate of 41.8% compared to the pre- magnet program implementation group return rate of 19.5%. Overall, in both the pre- and post- intervention groups, female adolescents (36.7%) were more likely to return to the clinic to receive shot two over their male counterparts (33.3%).

Of the adolescents who received a magnet as a patient appointment reminder, African American males had the highest rates of return for dose-two at 100%, followed by Caucasian females at 34.3% and Caucasian males at 26.2%. Hispanic females had the lowest return rates for dose-two, in the post-intervention group, at 10%. There was a significant increase in the return rates of all patients who received magnets as patient appointment reminders. This is illustrated in Figure 1. Data was not collected evaluating return rates for dose-three or completion rates of the vaccine series due to the limited time frame of this study.

Discussion

As the nation's HPV vaccination rates continue to fall short of the Healthy People 2020's goal to have 80% of all adolescents complete the three-part vaccine series it is crucial that evidence-based strategies to improve these rates are developed and evaluated. This study aimed to evaluate the effectiveness of a magnet program implemented at a public health department in rural Indiana in an attempt to increase the facility's return rates for dose-two of the three-part HPV vaccine series. Evidence supports the use of reminder alert systems in increasing HPV

vaccination rates in other clinical settings and findings from the current study support their use as well (Henson & Niccolai, 2016).

Overall, the study results demonstrate that implementation of a patient reminder magnet program can significantly increase the return rates for shot two of the HPV vaccine series in both adolescent males and females. Findings from this study suggest the same intervention could also be effective in increasing HPV vaccine series completion rates; however, due to time constraints in this study, data only evaluated return rates for dose two of the series. These findings could be used as a proxy measure for return rates for dose three and/or vaccine completion rates.

New Vaccine Recommendations

During the conduction of this study, the Centers for Disease Control and Prevention (CDC) as well as the Advisory Committee on Immunization Practices (ACIP) issued a new recommendation to allow adolescents aged 9 to 14 years receive only two doses of the HPV vaccine, at least six months apart, rather than the previously recommended three-dose vaccine series to protect against cancers caused by HPV infections. Teens and young adults, who initiate the series after their 15th birthday through the age of 26 years, will continue to need all three doses of the HPV vaccine (CDC, 2017). This decision came after the CDC and ACIP reviewed data from clinical trials showing two doses of HPV vaccine in younger adolescents (aged 9-14 years) produced an immune response similar or greater than the response in young adults (aged 16-26 years) who received three doses.

The CDC recommends vaccination for the HPV vaccine to begin at age 11 or 12 years, in order to provide protection before the start of sexual activity or exposure to the virus (CDC, 2016). The recommendation to decrease the HPV series from three doses to two will make it

more convenient for parents to get their children vaccinated; and will increase series completion rates as patient compliance declines with each subsequent dose of the three-part series.

Practice Implications

Implications from this study support the use of a patient appointment magnet program. There was a significant increase in the return rates for dose-two of the vaccine series in both males and females who received a magnet as a patient appointment reminder; this would now be considered series completion under new guidelines issued by the CDC and ACIP (for adolescents under the age of 15 years).

MERCK pharmaceuticals stopped the distribution of magnets as patient appointment reminders in early 2017. A systematic review conducted in 2016 found follow-up telephone calls and reminder emails to be less expensive interventions than postcard or magnet reminders and had similar results on adolescent vaccination rates (JAMA, 2016). The average cost for a telephone reminder was \$16.68 per adolescent per year compared to a mailed reminder which cost \$18.78 per adolescent per year. Overall, immunization rates at the end of this study were found to be 56% for mailed reminder group, 53% for the telephone reminder group, and 50% for controls ($P < .05$ for mailed or telephone versus control).

Based on these findings and in light of findings from similar studies, I recommend that clinicians who are seeking to increase their facility's HPV vaccination rates consider implementing a reminder alert system which utilizes phone calls or emails for patient follow-up appointments. In clinics that currently have a reminder alert system incorporating phone calls and emails whose HPV vaccination rates continue to remain below target goals, I would recommend the implementation of a magnet program.

Vaccination Rates

Historically, national trends have found HPV vaccination rates to be higher among female adolescents. Data collected from the National Immunization Survey-Teen (2015), found coverage among adolescents aged 13 to 17 years increased for each HPV vaccine dose among males, (from 41.7% to 49.8%), and only increased modestly for females, (from 60.0% to 62.8%). This indicates that while more girls are receiving the HPV vaccine compared to boys, the gap is beginning to narrow. It is estimated that the disparity between the two groups will soon be eliminated (CDC, 2016). This finding was supported in my study with 44% of females returning to the clinic for dose-two compared to 37% of males in the post-intervention group.

Additionally, nationwide findings suggest HPV vaccine coverage is higher among adolescents living in households below the poverty level, compared with adolescents in households at or above the poverty level (CDC, 2016). Coverage with each HPV vaccine dose was also found to be higher among Hispanic and non-Hispanic black (black) adolescents than among non-Hispanic white (white) adolescents (CDC, 2016). It is predicted that minority adolescents living below the poverty line have higher HPV vaccination rates as they are recipients of the Vaccine for Children program, a federal program which provides vaccines free of costs to children with need.

Data from my study partially supports these findings. In female adolescents, Caucasian females (38.5%) had the highest overall return rate for dose-two compared to African American females (29%) and Hispanic females (10%) in pre- and post- intervention groups. In male adolescents, African American males (58.5%) had the highest overall return rate for dose-two compared to Caucasian males (30.5%) and Hispanic males (16.5%) in the pre- and post-intervention groups. This could be due to the fact that the sample was comprised of 78%

Caucasian patients; therefore results may not be generalizable to minority populations. See Table 2.

While there was clinical significance found in the return rates for dose-two of the vaccine series in all patient demographics who received a magnet as a patient appointment reminder, statistical significance cannot be concluded due to small sample sizes. The limited sample may have also skewed the results for Hispanic females (20%) and African American males (100%) in the post-intervention groups. This is not consistent with findings in other studies and is likely impacted by limited diversity in the population of Gibson County.

Limitations

Several limitations were identified in the design of this study. Time constraints of the study limited data collection to return rates of dose two of the series and prevented evaluation of return rates for dose three/series completion rates. The data were collected from a single health clinic located in rural Indiana limiting the generalizability of the findings. Because this study was performed retrospectively, there was no way to ensure patient information was entered into the electronic medical record correctly to prevent against inaccurate results and distortion of outcomes in either group.

Although all adolescent patients who received the HPV vaccine at the Gibson County Health Department during the past year were analyzed and not randomly selected, the sample size for certain demographics (African American and Hispanic) remained small. A limited sample size can make it difficult to find a statistical difference between data sets and challenging to extrapolate results to the general population.

Another limitation of this study is that direct costs of the magnet program were not evaluated. A cost analysis was not performed in this study as estimated cost savings and direct costs were not disclosed to the PI. The direct costs of a magnet program may vary.

Recommendations for Future Studies

Data from this study suggest that a magnet program could be effective in increasing HPV vaccine completion rates; however, due to time constraints this could not be evaluated. A longitudinal study is needed to fully represent the effects of this intervention. Future studies should expand the time of the magnet program to one year in order to evaluate return rates for dose three/series completion rates. Additional recommendations include further investigation of other patient reminder systems such as: text messages, phone calls, or postcards to better evaluate the effectiveness of these strategies on HPV vaccination rates. These types of studies are essential not only for increasing return rates for the HPV vaccine but could also improve rates of other vaccines (e.g., pneumonia or hepatitis vaccines) or increase patient adherence to follow-up appointments. As this study was conducted at a public health department in rural Indiana a comparison study utilizing a larger, more diverse patient population may increase generalizability. Investigating vaccination rates after the recent recommendation made by the Advisory Committee on Immunization Practices (ACIP) to decrease the vaccine series from three doses to two will also be necessary as this will likely increase series completion rates.

Conclusion

The goal of this study was to evaluate the effectiveness of a magnet program on increasing patient return rates for shot two of the three-part HPV vaccine series. This study found that patients who received a magnet as patient appointment reminders were 22.3% more likely to return for shot two of the three-part HPV vaccine series. As primary care providers across the

nation are seeking evidenced-based strategies to incorporate into their practices this study demonstrates that the use of magnets as patient appointment reminders has shown to be effective in increasing return rates for dose 2 of the HPV vaccination series; which would now be considered series completion under new guidelines made by the CDC and ACIP.

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Table 1. Demographic characteristics by group (N=122)

Demographic Characteristics by Groups			
Characteristic	Pre-magnet program (n=31)	Post-magnet program (n=91)	p (sig=>.05)
Age, years Mean (SD)	15.3 (2.0)	14.5 (2.3)	.12
Sex			.25
Male	11 (35.5%)	43 (47.3%)	
Female	20 (64.5%)	48 (52.7%)	
Race/ethnicity			.040
White	21 (67.7%)	76 (83.5%)	
African American	8 (25.8%)	7 (7.7%)	
Hispanic	2 (6.5%)	8 (8.8%)	
Notes: Standard deviation (SD)			

Table 2. Percent of patients returning for dose-two of HPV vaccine series based on patient demographics in pre- and post- intervention groups.

Demographic	Return rates pre- (n=31)	Return rates post- (n=91)	p (Sig=>.05)
FEMALES	20% (n=20)	44% (n=48)	.65
African American	25% (n=4)	33% (n=6)	
Caucasian	20% (n=15)	57% (n=37)	
Hispanic	0% (n=1)	20% (n=5)	
MALES	18% (n=11)	37% (n=43)	<.001
African American	17% (n=6)	100% (n=1)	
Caucasian	25% (n=4)	36% (n=39)	
Hispanic	0% (n=1)	33% of (n=3)	

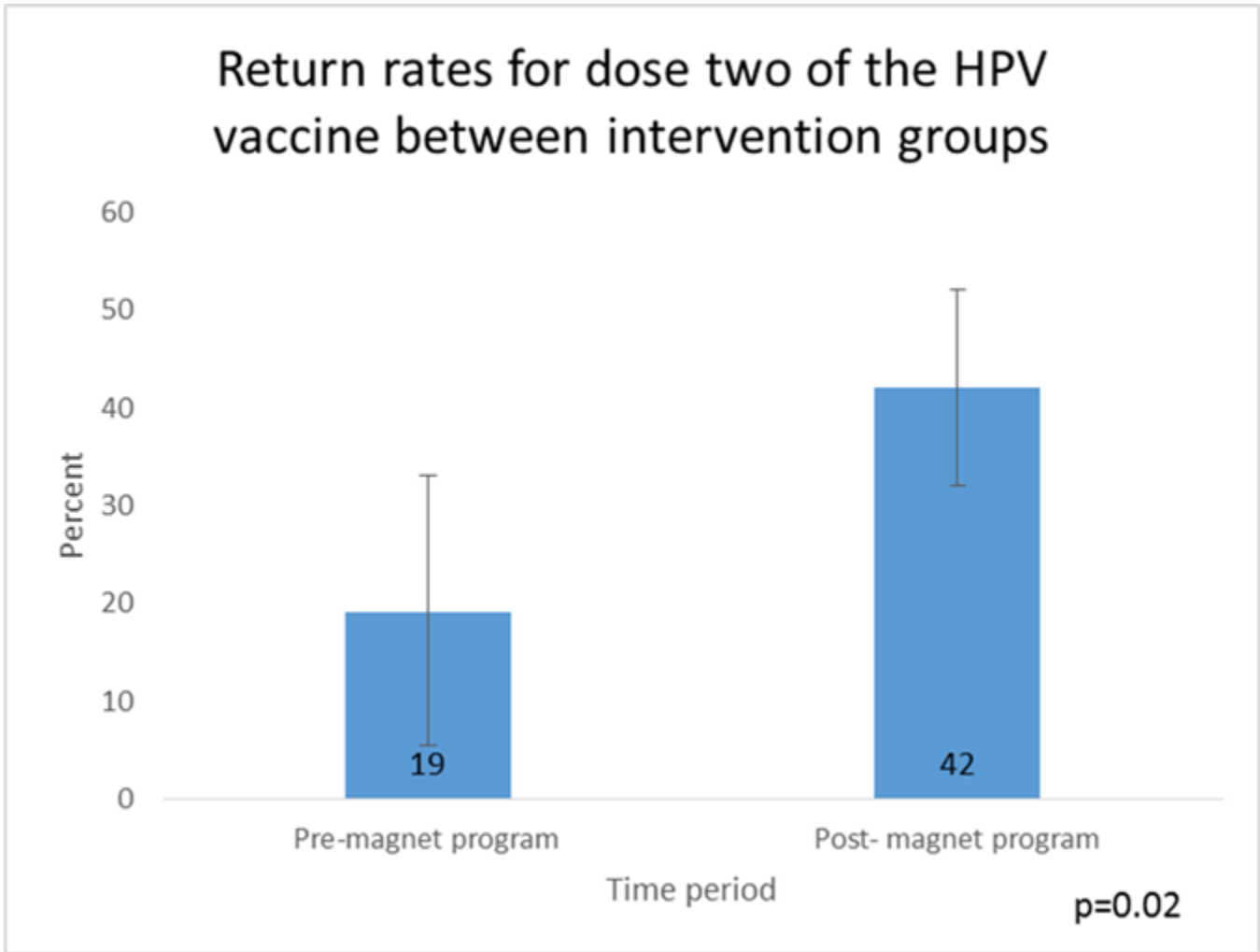


Figure 1. Percent receiving dose-two of HPV vaccine series with 95% confidence intervals.