

# Journal of Applied Research on Children: Informing Policy for Children at Risk

Volume 10

Issue 2 *Vaccinations in Texas: Lessons Learned for Evidence-Based Practices for Child Health*

Article 5

2019

## Knowledge About the Human Papillomavirus Vaccine Among Employees at a Tertiary Cancer Center: Room for Improvement

Kristina R. Dahlstrom

*The University of Texas MD Anderson Cancer Center, kdahlstrom@mdanderson.org*

Erich M. Sturgis

*The University of Texas MD Anderson Cancer Center, esturgis@mdanderson.org*

Ronald A. DePinho

*The University of Texas MD Anderson Cancer Center, rdepinho@mdanderson.org*

Ernest Hawk

*The University of Texas MD Anderson Cancer Center, ehawk@mdanderson.org*

George P. Baum

*The University of Texas MD Anderson Cancer Center, gpbaum@mdanderson.org*

*See next page for additional authors*

Follow this and additional works at: <https://digitalcommons.library.tmc.edu/childrenatrisk>

### Recommended Citation

Dahlstrom, Kristina R.; Sturgis, Erich M.; DePinho, Ronald A.; Hawk, Ernest; Baum, George P.; Tamez, Elenita; Bello, Rosalind S.; Stevens, Lori D.; and Ramondetta, Lois M. (2019) "Knowledge About the Human Papillomavirus Vaccine Among Employees at a Tertiary Cancer Center: Room for Improvement," *Journal of Applied Research on Children: Informing Policy for Children at Risk*: Vol. 10 : Iss. 2 , Article 5.

Available at: <https://digitalcommons.library.tmc.edu/childrenatrisk/vol10/iss2/5>

The *Journal of Applied Research on Children* is brought to you for free and open access by CHILDREN AT RISK at DigitalCommons@The Texas Medical Center. It has a "cc by-nc-nd" Creative Commons license" (Attribution Non-Commercial No Derivatives) For more information, please contact [digitalcommons@exch.library.tmc.edu](mailto:digitalcommons@exch.library.tmc.edu)

---

## Knowledge About the Human Papillomavirus Vaccine Among Employees at a Tertiary Cancer Center: Room for Improvement

### Acknowledgements

The authors wish to thank Stephanie Deming for manuscript editing. Funding: This research was supported in part by the National Institutes of Health through MD Anderson's Cancer Center Support Grant [grant number CA016672]. This research was accomplished within the MD Anderson Cancer Center HPV-Related Cancers Moon Shot Program, the Stiefel Oropharyngeal Research Fund, which supports the MD Anderson Oropharynx Program, and the Christopher and Susan Damico Chair in Viral Associated Malignancies at The University of Texas MD Anderson Cancer Center. Conflicts of interest: Dr. Hawk reports non-financial relationships with Huntsman Cancer Institute, Kansas University Medical Center, Maya Clinic Cancer Center, Ohio State University, Roswell Park Cancer Institute, University of Nebraska Medical Center, UT Southwestern, American Cancer Society, University of Alabama Mitchell Cancer Institute, Johns Hopkins University, NCI, Oncology Nursing Society Conference, Weill Cornell Medical College, AACR, ASCO, Alliance Prevention Committee, John Wiley & Sons Ltd.

### Authors

Kristina R. Dahlstrom, Erich M. Sturgis, Ronald A. DePinho, Ernest Hawk, George P. Baum, Elenita Tamez, Rosalind S. Bello, Lori D. Stevens, and Lois M. Ramondetta

## Knowledge About the Human Papillomavirus Vaccine Among Employees at a Tertiary Cancer Center: Room for Improvement

### INTRODUCTION

Human papillomavirus (HPV) is associated with substantial morbidity and mortality. HPV is the cause of virtually all cervical dysplasias and cancers as well as all cases of genital warts and most oropharyngeal, vaginal, vulvar, penile, and anal cancers. The HPV vaccine has been available since 2006 and is recommended by the U.S. Centers for Disease Control and Prevention (CDC) for routine vaccination of boys and girls to protect against HPV-related cancers and genital warts.<sup>1,2</sup> Population-level impact has already been observed in the United States and elsewhere in the form of decreased incidence of HPV-related diseases including cervical cancer attributed to vaccine-preventable HPV types (16 and 18).<sup>3-6</sup> The *Healthy People 2020* target for HPV vaccination is 80% coverage for both boys and girls<sup>7</sup>; however, HPV vaccine uptake has been low in the United States compared to other nations. In 2018, the most recent estimate available, 44% of adolescents had completed the vaccine series in Texas.<sup>8</sup>

Several studies have identified significant barriers to HPV vaccination among both health care providers and parents.<sup>9-12</sup> A major barrier cited by parents is lack of a recommendation from a health care provider. In the 2018 National Immunization Survey–Teen (NIS-Teen), ≥1 dose HPV vaccination coverage was only 47% among adolescents whose parents had not received a recommendation compared with 75% among adolescents whose parents had.<sup>8</sup> Furthermore, receiving a provider recommendation varied by state (60%-91%) and has led the CDC to prioritize supporting providers to give a strong recommendation. Reasons a provider may be hesitant to recommend vaccination are lack of knowledge regarding association between HPV infection and non-cervical HPV-related cancers or genital warts, concerns regarding parents' attitudes toward the vaccine, the financial impact for parents, and inadequate or slow reimbursement.<sup>9,10,13-15</sup> Furthermore, some providers may have a preference for vaccinating older versus younger adolescents or girls versus boys. Among parents, insufficient knowledge about the vaccine in terms of safety and potential adverse events, belief that the child is too young, or that vaccinating could lead to promiscuity are additional barriers.<sup>9,11,14-16</sup> Unfortunately, lack of awareness that the vaccine is available and beneficial for males has been cited by both providers and parents as a reason for not vaccinating.<sup>9-11</sup>

To meet the *Healthy People 2020* HPV vaccination target, it is imperative to provide parents with accurate information and ensure that health care providers are aware of the importance of strongly recommending the HPV vaccine to all eligible adolescents. The goal of this study was to determine the vaccination patterns and attitudes toward the HPV vaccine among employees at a tertiary cancer center in order to identify focus areas for education. We also sought to determine whether these differed with respect to health care provider status. The study was designed not only to gather information but also to be informative for employees as they are in a position to advocate for HPV vaccination to patients and the public.

## **METHODS**

The study was conducted at an urban tertiary cancer center. All employees were invited to participate in an online survey through an institution-wide email from the institution's president as well as an online employee news article that contained a link to the survey. In addition, division heads were encouraged to send reminder emails to all employees in their divisions, and a reminder was posted on the employee news webpage. The link to the survey was active for 2 weeks, from July 27, 2015, through August 10, 2015. The survey was administered using the online survey software Qualtrics (Provo, Utah) through the Office of Health Policy, and no incentive was offered.

The anonymous survey (see Appendix) included questions about respondents' health care provider status (health care provider or not) and health care provider classification (eg, physician, physician assistant, nurse practitioner, nurse, social worker). Respondents were also asked about their knowledge regarding HPV-vaccine insurance coverage as we wanted to clarify through survey question design that HPV vaccinations are covered by insurance and also covered for those who are uninsured. Respondents were asked whether they had completed the HPV vaccine series (3 doses at the time of the survey). Those who reported not having completed the series were given a list of potential reasons, including ineligibility due to age, and were asked to choose the main reason why they had not completed the series. An option to indicate "other" as the main reason and an option to provide a text comment were also provided. These responses were categorized by theme (eg, "1 partner" or "am in a committed relationship" were categorized together and "by the time I knew about it, I was too old" and "didn't know about it until after I was 26" were categorized together).

Additionally, respondents were asked about their children's vaccination history. If a respondent reported that a child had not completed the vaccine series, the respondent was given a list of potential reasons, including ineligibility due to age, and was asked to choose the main reason. An option to indicate "other" as the main reason and an option to provide a text comment were also provided. These responses were categorized as previously described. Respondents were asked about each of their children, and results are reported for each child. Respondents were also asked about intention to vaccinate young children in the future and interest in an institutional vaccination clinic for employees and their children. This study was considered exempt from review by the institutional review board due to the anonymous nature of the survey.

### *Statistical analysis*

All statistical analyses were done using Stata 12.0 (StataCorp, College Station, Texas). All tests were 2-sided, and  $p < .05$  was considered statistically significant. Standard descriptive statistics were used to describe the study population. Chi-square or Fisher's exact test was used to determine whether differences between groups were statistically significant.

## **RESULTS**

### *Characteristics of participants*

A total of 20,673 employees were invited to participate, and 4366 completed the survey (response rate, 21%; **Table 1**). Of the total employee population, 50% of the faculty (862 of 1709) completed the survey, compared with 35% of students and trainees (449 of 1293) and only 17% of administrative and other staff (2970 of 17,671). The majority of respondents (64%) were non-health care providers. Of the respondents who were health care providers, 11% cared for pediatric patients at least 25% of the time.

### *Knowledge about HPV vaccine insurance coverage*

While most respondents knew that the vaccine is covered under the Affordable Care Act (58% of respondents knew) and the Vaccines for Children program (57%), less than a quarter (21%) knew that it is covered under the Adult Safety Net program (**Table 1**). Health care providers were significantly more likely than non-health care providers to know that the vaccine is covered for most eligible individuals.

**Table 1. Health care provider status and knowledge about HPV vaccine insurance coverage among employees responding to survey.**

Survey question and responses	Health care provider status			<i>p</i>
	All N=4,366	Health care provider N=1,548	Non-health care provider N=2,787	
	N (%)	N (%)	N (%)	
<b>Health care provider classification</b>				
Physician	--	403 (26.1)	--	
PA/NP	--	226 (14.7)	--	
Nurse	--	480 (31.1)	--	
Social worker/case manager	--	425 (27.6)	--	
Other	--	8 (0.5)	--	
Missing		6		
<b>Care for pediatric patients ≥25% of time</b>				
No	--	1,369 (88.9)	--	
Yes	--	171 (11.1)	--	
Missing		8		
Sex				.671
Male	1,163 (26.8)	406 (26.4)	749 (27.0)	
Female	3,178 (73.2)	1,134 (73.6)	2,029 (73.0)	
Missing	25	8	15	
Know that HPV vaccine is covered by ACA				<.001
No	1,811 (41.8)	484 (31.7)	1,316 (47.4)	
Yes	2,518 (58.2)	1,041 (68.3)	1,463 (52.6)	
Missing	37	14	11	
Know that HPV vaccine is covered by VFC				<.001
No	1,851 (42.7)	564 (36.7)	1,274 (45.9)	
Yes	2,487 (57.3)	972 (63.3)	1,503 (54.1)	
Missing	28	12	13	
Know that HPV vaccine is covered by ASN				<.001
No	3,439 (79.2)	1,151 (74.5)	2,268 (81.8)	
Yes	905 (20.8)	394 (25.5)	506 (18.2)	
Missing	22	5	20	

*Italics indicates statistical significance ( $p < .05$ )*

HPV, human papillomavirus; PA/NP, physician assistant/nurse practitioner; ACA, Affordable Care Act; VFC, Vaccines for Children program; ASN, Adult Safety Net program.

*Vaccination patterns*

**Table 2** shows the vaccination patterns of respondents overall and by health care provider status. Approximately half of respondents either had completed the vaccine series or indicated that their reason for not being vaccinated was something other than age ineligibility; these respondents (52% of men and 48% of women) were assumed to have been eligible for HPV vaccination. Of those eligible, 13% (80/607) of men and 33% (499/1514) of women had completed the vaccine series. Among eligible individuals, the most common reason for not completing the series among both men and women was lack of knowledge that the vaccine was needed (51% for men and 27% for women). Very few respondents had safety concerns about the vaccine or did not feel they had enough information about the vaccine. The most common write-in reasons for not having completed the vaccine series were not being aware of the vaccine until over age 26 (N=30), already having been diagnosed with HPV infection (N=14), being in a monogamous relationship (N=31), and inconvenience (N=6).

Among men eligible for the HPV vaccine, there was no difference in personal vaccination rates between health care providers and non-health care providers ( $p=.632$ ). Likewise, reasons for not completing the vaccine series did not differ between these 2 groups ( $p=.126$ ; **Table 2**). However, among women eligible for the vaccine, providers were significantly more likely than non-providers to have completed the 3-dose series (40% vs 30%;  $p<.001$ ). In addition, among women, providers were significantly less likely than non-providers to cite not knowing they needed the vaccine (20% vs 29%) or safety concerns (6% vs 7%) as the main reason for completing the vaccine series (**Table 2**).

**Table 2. HPV vaccination patterns of employees responding to survey by sex and health care provider status.**

	All		Male		Female	
	Male N=1163 N (%)	Female N=3178 N (%)	Health care provider N=406 N (%)	Non- health care provider N=749 N (%)	Health care provider N=1134 N (%)	Non- health care provider N=2029 N (%)
Completed the HPV vaccine series						
No	527 (86.8)	1015 (67.0)	144 (85.7)	381 (87.2)	288 (59.9)	721 (70.3)
Yes	80 (13.2)	499 (33.0)	24 (14.3)	56 (12.8)	193 (40.1)	304 (29.7)
Not eligible	547	1644	236	306	645	992
Missing	9	20	2	6	8	12
Reason for not completing if eligible						
Started but never finished	3 (0.6)	50 (5.0)	2 (1.4)	1 (0.3)	23 (8.1)	27 (3.8)
Didn't know it was needed	262 (50.6)	269 (26.8)	66 (46.5)	196 (52.4)	57 (20.1)	210 (29.4)
Safety concerns	16 (3.1)	69 (6.9)	6 (4.2)	10 (2.7)	16 (5.6)	52 (7.3)
Health care provider did not recommend it	58 (11.2)	210 (20.9)	17 (12.0)	41 (11.0)	57 (20.1)	153 (21.4)
Don't have enough information about the vaccine	41 (7.9)	84 (8.4)	9 (6.3)	32 (8.6)	21 (7.4)	62 (8.7)
Not sexually active	30 (5.8)	91 (9.1)	4 (2.8)	26 (7.0)	35 (12.3)	56 (7.8)
Didn't know it was covered by my insurance	24 (4.6)	35 (3.5)	9 (6.3)	15 (4.0)	9 (3.2)	25 (3.5)
Other	84 (16.2)	195 (19.4)	29 (20.4)	53 (14.2)	66 (23.2)	129 (18.1)
Missing	9	12	2	7	4	7
HPV, human papillomavirus.						



Sixty-one percent of the respondents (N=2664) had children. Of 2659 daughters, 2038 (77%) were eligible to be vaccinated, and of 2077 sons, 1562 (75%) were eligible to be vaccinated (**Table 3**). Of the children who were eligible, 899 (44%) girls and 376 (24%) boys had completed the vaccine series. Children of providers were significantly more likely to have completed the vaccine series than were children of non-providers (boys, 29% vs 22%,  $p=.001$ ; girls, 48% vs 42%,  $p=.004$ ). Reasons for not vaccinating children differed for boys and girls (**Table 3 and Figure 1**). Although not knowing that vaccination was needed was a common reason for not vaccinating both boys and girls, this reason was more common for boys than for girls, and providers were less likely to cite this reason than were non-providers. There was no difference in vaccine completion rates between households with both boys and girls and those with only boys or only girls ( $p=.892$  and  $p=.991$ , respectively; data not shown). The majority of participants with children who were too young for vaccination were planning to have children vaccinated when they were old enough (boys, 79%; girls, 82%); providers were significantly more likely than non-providers to indicate such plans ( $p=.010$  for girls and  $p=.001$  for boys; **Table 3**).

Write-in reasons for not vaccinating children were child is developmentally disabled or autistic and unlikely to become sexually active (N=3), parent does not vaccinate children at all (N=2), pediatrician recommended waiting until child is older (N=3), parent believes that vaccine offers a false sense of security as it does not cover all high-risk HPV types (N=5), long-term side effects are unknown (N=9), doctor did not have vaccine available (N=2), getting all 3 doses is too much trouble (N=3), doctor refuses to give HPV vaccine as it is “not fully covered by insurance” (N=2), parent does not want government to be involved in health care decisions (N=4), and parent believes HPV-related cancers are rare and therefore vaccine is not warranted (N=1).

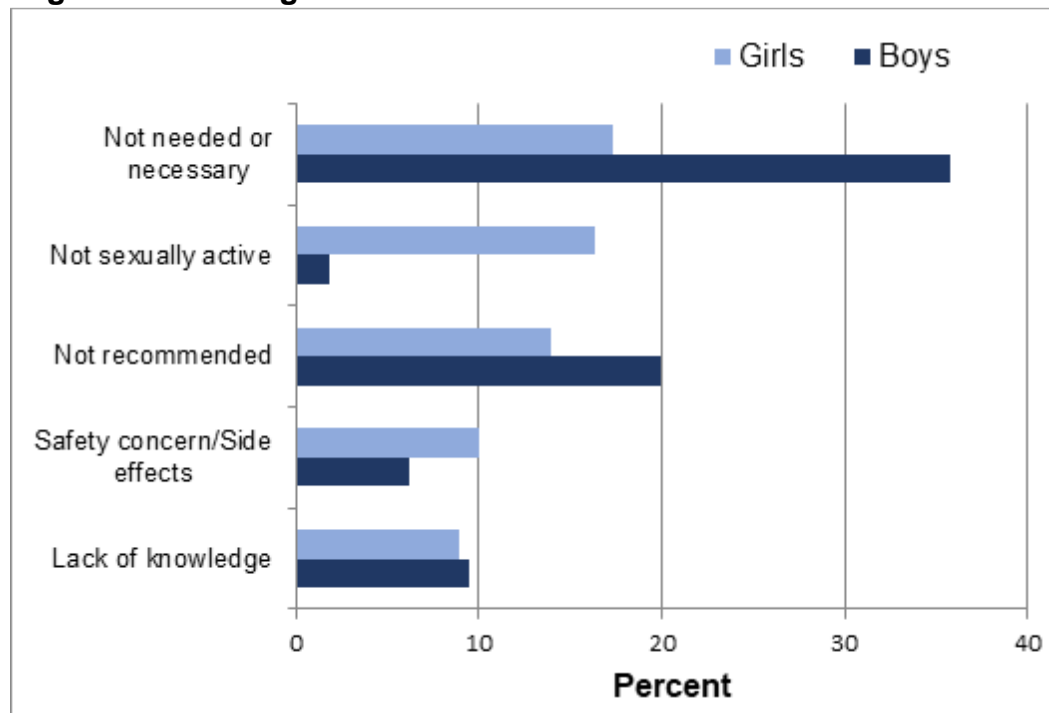
In response to the question whether employees would be willing to bring their children to an immunization clinic if it were offered for employees on the institution’s campus on a weekend, 58% of respondents with children expressed an interest.

**Table 3. HPV vaccination patterns of children of employees responding to survey by health care provider status.**

	All		Sons		Daughters	
	Sons N=2077	Daughters N=2659	Health care provider N=801	Non- health care provider N=1238	Health care provider N=991	Non- health care provider N=1649
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Completed the HPV vaccine series						
<i>No</i>	1186 (75.9)	1139 (5.9)	395 (71.3)	758 (78.5)	371 (51.7)	761 (58.3)
<i>Yes</i>	376 (24.1)	899 (44.1)	159 (28.7)	215 (21.5)	347 (48.3)	544 (41.7)
<i>Not eligible</i>	515	621	247	265	273	344
Reason for not completing if eligible						
<i>Started but never finished</i>	35 (3.2)	45 (4.2)	16 (4.4)	19 (2.6)	19 (5.4)	26 (3.7)
<i>Didn't know it was needed</i>	390 (35.8)	185 (17.3)	106 (29.0)	283 (39.3)	38 (10.7)	145 (20.4)
<i>Safety concerns</i>	68 (6.2)	107 (10.0)	30 (8.2)	38 (5.3)	43 (12.2)	64 (9.0)
<i>Health care provider did not recommend it</i>	218 (20.0)	149 (13.9)	72 (19.7)	145 (20.1)	44 (12.4)	105 (14.8)
<i>Don't have enough information about the vaccine</i>	104 (9.5)	95 (8.9)	31 (8.5)	71 (9.9)	30 (8.5)	65 (9.1)
<i>Child not sexually active</i>	20 (1.8)	175 (16.4)	7 (1.9)	13 (1.8)	67 (18.9)	108 (15.2)
<i>Didn't know it was covered by my insurance</i>	1 (0.1)	21 (2.0)	1 (0.3)	0	6 (1.7)	15 (2.1)
<i>Other</i>	255 (23.4)	293 (27.4)	103 (28.1)	151 (21.0)	107 (30.2)	184 (25.8)

<i>Missing</i>	95	69	29	65	17	49
If child too young, plan to vaccinate when old enough						
No	99 (21.2)	97 (18.0)	34 (14.9)	65 (27.7)	31 (13.3)	66 (21.9)
Yes	367 (78.8)	442 (82.0)	194 (85.1)	170 (72.3)	203 (86.8)	236 (78.2)
HPV, human papillomavirus.						

**Figure 1. Reasons given by employees for not vaccinating their eligible children against HPV.**



## DISCUSSION

In this survey study of employees at a tertiary cancer center, we found that the majority of eligible employees and employees' eligible children had not completed the HPV vaccine series, and employees' knowledge about the HPV vaccine was lacking. We were surprised by these findings in this group with such close contact with people with cancer.

Only 44% of respondents' eligible daughters and 24% of respondents' eligible sons had completed the HPV vaccine series at the time the survey was conducted. These rates were approximately the same as the 2015 national and Texas-specific rates of 42% and 41%, respectively, for girls and 28% and 24%, respectively, for boys as well as approximately the same as rates for the city of Houston, Texas, where our institution is located (43% for girls and 23% for boys).<sup>17</sup> The HPV vaccination rate among eligible employees was lower than that of employees' children (13% of men and 33% of women). This appears to be due to, in part, a lack of information in the years immediately following vaccine introduction and a lack of a recommendation from a provider.

Our results are largely consistent with psychosocial barriers to HPV vaccination described previously, including knowledge of vaccine and recommendations, perceived benefits and susceptibility, perceived vaccine safety, and provider recommendation.<sup>18,19</sup> Importantly, studies have consistently shown that one of the most important factors for parents in deciding to vaccinate is a strong recommendation from a health care provider.<sup>8,20,21</sup> In our study, we found that 14% of respondents with vaccine-eligible but unvaccinated daughters and 20% of respondents with vaccine-eligible but unvaccinated sons cited lack of recommendation from a provider as the main reason for lack of vaccination. These findings regarding lack of recommendation from a provider agree with previously reported findings from a national survey.<sup>8</sup> Unfortunately, some respondents reported that their provider had advised waiting until the child was older than 12 years even though the CDC recommendation is to vaccinate 11- and 12-year-olds. In other cases, the provider did not have the vaccine available.

Concerning insurance coverage and cost of the vaccine, some respondents reported that their provider did not offer the vaccine because it was not “fully covered by insurance.” These responses reflect provider lack of knowledge about the vaccine and insurance coverage; most eligible individuals in fact qualify to receive the HPV vaccine at no or low cost through the Affordable Care Act, Vaccines for Children program, or Adult Safety Net program. Many survey respondents, even providers, were unaware of this fact. Concerns about cost of vaccine have previously been reported in other U.S. surveys.<sup>9,19</sup>

The low vaccination rate among employees themselves seems to be a reflection of being unaware of the vaccine or necessity for it as has been seen with providers and survivors regarding knowledge of effectiveness, timeliness, safety, and coverage and willingness to vaccinate or get family members vaccinated.<sup>22-24</sup> In a Web-based survey of parents to 11- to 17-year old males in the United States, more than half of parents reported not vaccinating their son because they did not have a recommendation from a provider; however, vaccine acceptability was high, indicating that vaccination uptake could be greatly increased with strong and consistent recommendations from providers.<sup>25</sup>

What is discouraging about most published HPV intervention programs is that benefits of multimodality interventions involving the most effective interventions have limited change in vaccination rate of 9% to 14% improvement after interventions were employed.<sup>26,27</sup> And although it takes time to change societal beliefs and behaviors, new methods of “moving the dial” towards a pro-vaccine country are needed.<sup>28,29</sup> This is especially true due to the strength of the anti-vax community as evidenced by the recent

threat made towards a pediatrician for an educational Tick Tock video or a practice.<sup>30,31</sup> In a major cancer center where a significant number of HPV-related cancers are treated, and where there is strong support for HPV vaccination, our survey set out to explore if our employees were behind this mission to prevent further HPV-related cancers. What we found through this survey is that despite close contact with cancer patients, our employees, and even our survivors of HPV-related diseases, were no more educated or vaccinated than the general population.

Workplace health promotion programs are encouraged by the CDC.<sup>32</sup> Our institution is committed to improving the health of its employees and offers health promotion programs, including yearly flu vaccination programs, resources for smoking cessation and stress management, nutrition education, and a fitness center. As a result of this survey, HPV vaccination education can now be seen as a need for our employees, and our institution has been conducting an educational campaign on the benefits of HPV vaccination. The campaign currently includes online resources and informational talks at department meetings as well as posters and interactive educational materials available to employees, patients, and visitors throughout the campus.

### *Limitations*

The main limitation of this study was the low response rate. We took measures to increase the response rate, such as having the president send an institution-wide email, having division heads send reminders, and placing a prominent article in the employee newsletter. Despite these efforts, only 21% of employees completed the survey. It is possible that only employees with strongly held beliefs, either for or against HPV vaccination, chose to respond. Furthermore, some employees may have thought that the survey did not pertain to them and thus did not respond. For example, in our own experiences talking with colleagues, we found that many male employees seemed surprised when they were verbally asked to take the survey, stating, "I thought this was only for girls" or something similar. The survey was available online, and it is possible that some groups of employees did not have online access. The response rate varied according to employee classification, with a higher proportion of faculty than of other employees responding. It is possible that reminder emails sent out by department heads were more likely to be sent to faculty than to all department employees. Finally, we did not ask for the age of respondents or their children, and we assumed that employees and children were eligible to be vaccinated if the employee or parent did not choose "not eligible" as

the reason why someone was not vaccinated. This assumption resulted in half of respondents being classified as eligible for HPV vaccination. It is possible that age-eligible respondents were more likely to respond to the survey or those respondents who were not in fact eligible for HPV vaccination chose other reasons for not being vaccinated and were incorrectly classified as eligible for vaccination. Furthermore, the response to the survey questions pertaining to reasons for not completing the vaccine series included the option “wasn’t eligible (born before 1980),” which would only apply to girls since the vaccine was not available for boys until 2010 (questions 9, 10, 12, and 15). Therefore, this could result in misclassification of men (or sons) because they in fact were not eligible if they were born before 1984. Despite these limitations, the vaccination rates were approximately equivalent to population rates previously reported for Houston, and reasons for not vaccinating corresponded to those reported in larger population-based studies.

#### *Future directions*

Hospitals and other health care organizations have an opportunity to be leaders in workplace health promotion by adopting policies that not only benefit the health and well-being of their employees but also serve as role models for the community. Moreover, health care workers are often a main source of health information for the public and should therefore be knowledgeable about issues pertaining to public health. Literature exists regarding the safety and efficacy of the vaccine; however, new methods and platforms regarding education about disease prevention are needed. Although education is a start, it will take time and will likely not be enough.<sup>33</sup> We will use the results from this study to develop targeted education to increase our employees’ knowledge regarding HPV vaccination.

#### **CONCLUSION**

Opportunities exist to educate health care workers about the benefits of the HPV vaccine and to increase the number of providers who recommend HPV vaccination to their patients.

## REFERENCES

1. Markowitz LE, Dunne EF, Saraiya M, et al. Quadrivalent human papillomavirus vaccine: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR Recomm Rep.* 2007;56(RR-2):1-24.
2. Petrosky E, Bocchini JA Jr, Hariri S, et al. Use of 9-valent human papillomavirus (HPV) vaccine: updated HPV vaccination recommendations of the Advisory Committee on Immunization Practices. *MMWR Morb Mortal Wkly Rep.* 2015;64(11):300-304.
3. Hariri S, Bennett NM, Niccolai LM, et al. Reduction in HPV 16/18-associated high grade cervical lesions following HPV vaccine introduction in the United States - 2008-2012. *Vaccine.* 2015;33(13):1608-1613.
4. Benard VB, Castle PE, Jenison SA, et al. Population-based incidence rates of cervical intraepithelial neoplasia in the human papillomavirus vaccine era. *JAMA Oncol.* 2017;3(6):833-837.
5. Guo F, Cofie LE, Berenson AB. Cervical cancer incidence in young U.S. females after human papillomavirus vaccine introduction. *Am J Prev Med.* 2018;55(2):197-204.
6. Drolet M, Benard E, Perez N, Brisson M, HPV Vaccination Impact Study Group. Population-level impact and herd effects following the introduction of human papillomavirus vaccination programmes: updated systematic review and meta-analysis. *Lancet.* 2019;394(10197):497-509.
7. U.S. Department of Health and Human Services, Office of Disease Prevention and Health Promotion. Healthy People 2020. Washington, DC. <http://www.healthypeople.gov/2020/topics-objectives/topic/immunization-and-infectious-diseases/objectives>. Accessed April 7, 2020.
8. Walker TY, Elam-Evans LD, Yankey D, et al. National, regional, state, and selected local area vaccination coverage among adolescents aged 13-17 years - United States, 2018. *MMWR Morb Mortal Wkly Rep.* 2019;68(33):718-723.



9. Holman DM, Benard V, Roland KB, Watson M, Liddon N, Stokley S. Barriers to human papillomavirus vaccination among US adolescents: a systematic review of the literature. *JAMA Pediatr.* 2014;168(1):76-82.
10. Perkins RB, Clark JA. Providers' attitudes toward human papillomavirus vaccination in young men: challenges for implementation of 2011 recommendations. *Am J Mens Health.* 2012;6(4):320-323.
11. Berenson AB, Rahman M. Gender differences among low income women in their intent to vaccinate their sons and daughters against human papillomavirus infection. *J Pediatr Adolesc Gynecol.* 2012;25(3):218-220.
12. Reimer RA, Houlihan AE, Gerrard M, Deer MM, Lund AJ. Ethnic differences in predictors of HPV vaccination: comparisons of predictors for Latina and non-Latina white women. *J Sex Res.* 2013;50(8):748-756.
13. Quinn GP, Murphy D, Malo TL, Christie J, Vadaparampil ST. A national survey about human papillomavirus vaccination: what we didn't ask, but physicians wanted us to know. *J Pediatr Adolesc Gynecol.* 2012;25(4):254-258.
14. Goff SL, Mazor KM, Gagne SJ, Corey KC, Blake DR. Vaccine counseling: a content analysis of patient-physician discussions regarding human papilloma virus vaccine. *Vaccine.* 2011;29(43):7343-7349.
15. Luque JS, Raychowdhury S, Weaver M. Health care provider challenges for reaching Hispanic immigrants with HPV vaccination in rural Georgia. *Rural Remote Health.* 2012;12(2):1975.
16. Bastani R, Glenn BA, Tsui J, et al. Understanding suboptimal human papillomavirus vaccine uptake among ethnic minority girls. *Cancer Epidemiol Biomarkers Prev.* 2011;20(7):1463-1472.
17. Reagan-Steiner S, Yankey D, Jeyarajah J, et al. National, regional, state, and selected local area vaccination coverage among adolescents aged 13-17 years--United States, 2015. *MMWR Morb Mortal Wkly Rep.* 2016;65(33):850-858.
18. The University of Texas MD Anderson Cancer Center. HPV vaccine uptake in Texas pediatric care settings: 2014-2015 Environmental Scan

Report. <http://www.texascancer.info/hpv/#educationalmaterials>. Updated 2015. Accessed April 7, 2020.

19. Rodriguez SA, Mullen PD, Lopez DM, Savas LS, Fernandez ME. Factors associated with adolescent HPV vaccination in the U.S.: a systematic review of reviews and multilevel framework to inform intervention development. *Prev Med*. 2020;131:105968.
20. Lu PJ, Yankey D, Fredua B, et al. Association of provider recommendation and human papillomavirus vaccination initiation among male adolescents aged 13-17 years--United States. *J Pediatr*. 2019;206:33-41.e1.
21. Gilkey MB, Calo WA, Moss JL, Shah PD, Marciniak MW, Brewer NT. Provider communication and HPV vaccination: the impact of recommendation quality. *Vaccine*. 2016;34(9):1187-1192.
22. Henrikson NB, Tuzzio L, Gilkey MB, McRee AL. "You're never really off time": healthcare providers' interpretations of optimal timing for HPV vaccination. *Prev Med Rep*. 2016;4:94-97.
23. Rosen BL, Shepard A, Kahn JA. US health care clinicians' knowledge, attitudes, and practices regarding human papillomavirus vaccination: a qualitative systematic review. *Acad Pediatr*. 2018;18(2S):S53-S65.
24. Shelal Z, Cho D, Urbauer DL, et al. Knowledge matters and empowers: HPV vaccine advocacy among HPV-related cancer survivors. *Support Care Cancer*. 2019. doi 10.1007/s00520-019-05035-1.
25. Donahue KL, Stupiansky NW, Alexander AB, Zimet GD. Acceptability of the human papillomavirus vaccine and reasons for non-vaccination among parents of adolescent sons. *Vaccine*. 2014;32(31):3883-3885.
26. Community Preventive Services Task Force. Increasing appropriate vaccination: health care system-based interventions implemented in combination. The Community Guide Web site. <https://www.thecommunityguide.org/sites/default/files/assets/Vaccination-Health-Care-System-Based.pdf>. Published October 2014. Updated 2015. Accessed April 7, 2020.

27. Community Preventive Services Task Force. Increasing appropriate vaccination: Community-based interventions implemented in combination. The Community Guide Web site.  
<https://www.thecommunityguide.org/sites/default/files/assets/Vaccination-Community-Based-in-Combination.pdf>. Published 10/2014. Updated 2015. Accessed April 7, 2020.
28. Massey PM, Budenz A, Leader A, Fisher K, Klassen AC, Yom-Tov E. What drives health professionals to tweet about #HPVvaccine? Identifying strategies for effective communication. *Prev Chronic Dis*. 2018;15:E26.
29. The Editorial Board. How to inoculate against anti-vaxxers. *New York Times*. January 19, 2019.  
<https://www.nytimes.com/2019/01/19/opinion/vaccines-public-health.html>. Accessed April 7, 2020.
30. Lee BY. How this vaccination video went viral, but resulted in threats against pediatrician. *Forbes*. January 19, 2020.  
<https://www.forbes.com/sites/brucelee/2020/01/19/how-this-pro-vaccination-video-went-viral-but-resulted-in-threats-against-pediatrician/#18f50371516a>. Accessed April 7, 2020.
31. Hoffman BL, Felter EM, Chu KH, et al. It's not all about autism: the emerging landscape of anti-vaccination sentiment on Facebook. *Vaccine*. 2019;37(16):2216-2223.
32. Centers for Disease Control and Prevention. Workplace health model. CDC Workplace Health Promotion Web site.  
<https://www.cdc.gov/workplacehealthpromotion/model/index.html>. Published May 2016. Updated 2016. Accessed April 7, 2020.
33. Corace K, Garber G. When knowledge is not enough: changing behavior to change vaccination results. *Hum Vaccin Immunother*. 2014;10(9):2623-2624.

## APPENDIX

### HPV Vaccine Survey

1. What is your employee classification?
  - a. Faculty
  - b. Administrative
  - c. Classified
  - d. Student/Trainee

2. Are you a health-care provider?
  - a. Yes
  - b. No

*If no, skip to Q5*

3. What is your classification?
  - a. Physician
  - b. Physician assistant or nurse practitioner
  - c. Nursing
  - d. Social worker/case manager
  - e. Other \_\_\_\_\_
4. Do you care for pediatric patients (age <18 years) at least 25% of the time?
  - a. Yes
  - b. No
5. What is your gender?
  - a. Male
  - b. Female
6. The HPV vaccine series is covered by almost all insurance companies including those in the Affordable Care Act (Obama Care). Did you know this?
  - a. Yes
  - b. No
7. The HPV vaccine series is covered by the vaccines for eligible children program for children under age 18. Did you know this?
  - a. Yes
  - b. No

8. The HPV vaccine series is covered for uninsured eligible individuals between ages 18-26 under the adult safety net program and can be given at clinics like Legacy Mapleridge Clinic, Good Neighbor Healthcare Center, Hope Clinic in Houston. Did you know this?
- Yes
  - No

9. Have you been vaccinated for HPV (completed the 3-dose series)?
- Yes
  - No

Reason

- Started but never finished
- Wasn't eligible (born before 1980)
- Didn't know I needed it
- Safety concerns
- Health care provider did not recommend it
- Don't have enough information about the vaccine
- Not sexually active
- Didn't know it was covered by my insurance
- Other \_\_\_\_\_

10. Has your spouse/partner been vaccinated for HPV?
- Yes
  - No

Reason

- Started but never finished
- Wasn't eligible (born before 1980)
- Didn't know they needed it
- Safety concerns
- Health care provider did not recommend it
- Don't have a spouse/partner
- Don't have enough information about the vaccine
- Not sexually active
- Didn't know it was covered by insurance
- Other \_\_\_\_\_

11. Do you have any children?
  - a. Yes, one or more daughters
  - b. Yes, one or more sons
  - c. Yes, both daughters and sons
  - d. No, I don't have any children

*If no, please stop here.*

The next few questions will be about your daughters, starting with your oldest.

12. Has your oldest daughter been vaccinated for HPV?
  - a. Yes
  - b. No

Reason

- Started but never finished
- Wasn't eligible (born before 1980 or after 2005)
- Didn't know she needed it
- Safety concerns
- Pediatrician did not recommend it
- Don't have enough information about the vaccine
- She is not sexually active
- Didn't know it was covered by my insurance
- Other \_\_\_\_\_
- Not applicable

13. If your daughter is too young to be vaccinated, do you plan to have her vaccinated when she is old enough?
  - a. Yes
  - b. No

14. Do you have any more daughters?
  - a. Yes
  - b. No

The next few questions will be about your sons, starting with your oldest.

15. Has your oldest son been vaccinated for HPV?
  - a. Yes
  - b. No

Reason

- Started but never finished
- Wasn't eligible (born before 1980 or after 2005)
- Didn't know he needed it
- Safety concerns
- Pediatrician did not recommend it
- Don't have enough information about the vaccine
- He is not sexually active
- Didn't know it was covered by my insurance
- Other \_\_\_\_\_
- Not applicable

16. If your son is too young to be vaccinated, do you plan to have him vaccinated when he is old enough?
- a. Yes
  - b. No
17. Do you have any more sons?
- a. Yes
  - b. No
18. Would you bring your children to get the HPV vaccine series at the institution on a Saturday?
- a. Yes
  - b. No  
Why not? \_\_\_\_\_
  - c. Not applicable
19. If you have children that are eligible for the HPV vaccine but have not gotten them vaccinated, what would make you more likely to get your child vaccinated? \_\_\_\_\_