2021 Writing Contest graduate Winner

Understanding Factors Affecting Health Providers' Perceptions of Pharmacist Roles in HPV Vaccine Administration

Meliza Roman MS; May Rose Dela Cruz DrPH; Reni Soon MD MPH; Carolyn Ma PharmD; John J. Chen PhD

https://doi.org/10.62547/RDRV2180

Meliza Roman

Meliza Roman works as a Coordinator for the Biostatistics Core Facility at the University of Hawai'i John A. Burns School of Medicine (JABSOM), overseeing the collaborations between biostatisticians and researchers. She received a Bachelor of Arts degree in Public Health from the University of Hawai'i at Mānoa and recently earned her Master of Science degree in Quantitative Health and Clinical Research from JABSOM. Meliza's research interests are in evaluation studies, Filipino health, and women's health.

Abstract

Human papillomavirus (HPV) is a viral infection that sexually active females and males may be exposed to in their lifetime. The HPV vaccine is highly recommended especially among children to protect them before their anticipated exposure to HPV, however, vaccination uptake in Hawai'i remains low. As of 2017, legislation allows pharmacists to vaccinate for adolescent vaccines with the potential to increase access and opportunities for patients to complete the HPV vaccine series. Physicians in Hawai'i were surveyed to examine physicians' awareness of this law, their perceptions of the role of pharmacists, and willingness to send adolescent patients to pharmacies; 137 responses were received and analyzed. Overall, 72% (n=99) of respondents were willing while 28% (n=38) were unwilling to send patients to pharmacies for vaccines. Physicians view pharmacists' role as helpful but have concerns regarding correct administration and tracking doses given. Results show potential for more physician-pharmacist collaborations through further education and trainings for pharmacists and health providers to increase physician referrals for adolescent vaccine services in pharmacies.

Keywords

Human papillomavirus; HPV vaccine uptake; Pharmacists; Providers; Adolescent health

Abbreviations and Acronyms

ACIP = Advisory Committee on Immunization Practice
ACOG = American College of Obstetricians and Gynecologists
HPV = Human papillomavirus
OB/GYN = Obstetrician/gynecologist
OR = Odds ratio
REDCap = Research Electronic Data Capture
Tdap = Tetanus, diphtheria & acellular pertussis vaccine
VFC = Vaccines for Children

Introduction

Human papillomavirus (HPV) is one of the most commonly transmitted viral infections that sexually active males and females may be exposed to in their lifetime.[1] Many people clear HPV infections without any visible or apparent symptoms, but common health problems caused by HPV include genital warts and various HPV-associated cancers.[2] Different types of HPV are known to cause about 91% of cervical and anal cancers, more than 69% of vulvar and vaginal cancers, 70% of oropharyngeal cancers, and 63% of penile cancers according to the National Cancer Institute's Surveillance, Epidemiology, and End Results Program.[3] To address this issue, the HPV vaccine, which has been shown to be safe and effective, has been modified over the past decade to protect against 9 of the most common strains of the virus that can cause cervical and other cancers.[4] At the recommended administration ages of 11-12 years old, vaccinated children have time to build immunity against some of the strains of HPV before exposure. The Advisory Committee on Immunization Practice (ACIP) currently recommends that 9-14 year old males and females receive 2 doses of the HPV vaccine, at least 6 months apart.[5] As of 2019, after further studies of vaccine efficacy and safety the ACIP modified recommendations to encourage all persons through age 26 years to receive catch-up HPV vaccinations.[6]

One of the Healthy People 2030 goals is to increase the vaccination coverage level of completed HPV vaccinations of males and females aged 13-15 years old to 80% in the United States.[7] Nationally, 61.4% and 56.0% of females and males aged 13-17 years respectively, received at least 2 doses of the HPV vaccine.[8] In Hawai'i as of year 2021, 60.5% of female adolescents and 77.3% of male adolescents completed the HPV vaccine series of 2 to 3 doses by 15 years of age, which falls short of the nation's goals.[9] The Native Hawaiian and Filipino populations have the highest incidence and mortality rates of cervical cancer in Hawai'i, yet parents of these populations were less likely to initiate vaccination for their children compared to White and Japanese populations.[10,11] HPV vaccination uptake is critical to address especially for groups that are disproportionately impacted by adverse outcomes of HPV.

Barriers Faced by Health Providers

Although most pediatricians and family medicine physicians in Hawai'i stock and administer the HPV vaccine, there are other implications to be considered that affect the uptake of the vaccine.[12] Since a physician's recommendation is likely to influence the acceptance of the vaccine by adult patients and parents of adolescents, Soon et al found that Hawai'i physicians were more likely to recommend the HPV vaccine to older adolescents than to children ages 11-12 as advised by the ACIP.[12] In 2016, an online survey studying the knowledge, attitudes, practices, and barriers of HPV vaccination among practicing physicians in Hawai'i found that challenges faced in distributing the vaccine included financial risk for private practice physicians, lack of parent knowledge and understanding of HPV infection, and lack of school-based vaccination requirements at the time of the survey.[13] Private practice physicians reported concerns of upfront vaccine ordering and stocking costs, cost reimbursement, and insurance non-coverage in comparison to physicians working in group practices or larger health systems.[12,13] A common perceived barrier for physicians not only in Hawai'i, but also across the nation, is a parent's knowledge of HPV and their reluctance to discuss sexuality with children.[13,14] These barriers reflect the need for more ways for patients to access vaccinations.

Pharmacy's Role in Vaccine Administration

As an alternative to receiving the HPV vaccine and other adolescent vaccines through physicians, some states have begun to implement laws to include pharmacies as another setting for patients to conveniently receive adolescent vaccinations to increase vaccine uptake and fulfill missed doses. On July 3, 2017, Health Act 68 (17) amended Hawai'i State Law §461-11.4 allowing pharmacists with appropriate training credentials to vaccinate children 11-17 years old for HPV, tetanus, diphtheria, pertussis (Tdap), meningococcal, and influenza vaccines, with a valid prescription from the patient's primary care physician.[15] Additionally, the law requires pharmacists to report vaccination information to the patient's primary care provider within 72 hours of vaccination, and to the Hawai'i Immunization Registry within 5 business days of vaccination. Physician referrals to pharmacies would increase awareness and accessibility of adolescent vaccine services and provide more opportunities for immunization that include wider hours of operation, multiple locations, and quick service.[16]

The goal of this study was to understand physicians' attitudes and concerns regarding the role of pharmacies in vaccine administration in the state of Hawai'i. Since the 2017 legislative change allowing pharmacists the ability to administer vaccinations to adolescents, it is hypothesized that health providers are unaware and are underutilizing this law to refer patients to pharmacies. Further data is needed on whether health providers in Hawai'i would be willing to send patients to pharmacies, especially for the HPV vaccine, which requires at least 2 visits. The findings of this study could help in the creation of informational content for health providers on the role of pharmacists in vaccine administration, increase training for pharmacists, and curriculum changes for pharmacy students in Hawai'i. Stronger collaboration between health providers and pharmacies may increase referrals of patients to pharmacies in the future that would potentially increase HPV vaccination rates.

Methods

Survey Development and Design

The questionnaire for this study was adapted from a survey instrument that assessed the quality of physician's communication practices on the HPV vaccine, including pharmacy utilization.[17] The survey collected physician demographics, specialization, years in practice, the number of patients aged 11-17 years seen in an average week, and participation in the Vaccines for Children (VFC) program.[18] Adolescent vaccine practices were asked, such as if the provider has referred patients to pharmacies and if yes, for which vaccines, or if a provider has not referred patients, what are the reasons why they had not. Provider attitudes towards the benefit of the law allowing pharmacists as vaccinators was measured using a 5-point Likert scale, as were the importance and ease of use of pharmacies. Providers were also asked to select their benefits and concerns of pharmacists' provisions of the HPV vaccine among lists of benefits and concerns identified from prior studies understanding physicians' attitudes about HPV vaccination in Hawai'i.[12,13] This study was approved by the University of Hawai'i Institutional Review Board (IRB Protocol Number 2017-00067).

Survey Deployment

The survey was distributed among practicing Hawai'i physicians specializing in pediatrics, internal medicine, obstetrics and gynecology, and family medicine from November 2017 until February 2018. The mailing list was manually compiled

from online directories of practicing physicians in the state. Hard copy surveys were mailed to 200 private practice obstetricians/gynecologists (OB-GYNs), 124 pediatricians, 119 internists, and 11 family medicine physicians. Participants were excluded if they were not practicing physicians at the time of the study, did not provide consent, or if they provided consent but did not complete the survey. Participants had the option to fill out and mail back a hard copy survey or complete the survey online using Research Electronic Data Capture (REDCap) web-based software, version 10.6.10 (Vanderbilt University, Nashville, TN). Both the online survey and hard-copy mailings included an overview of the study from the study team. Statewide community-based organizations such as the Hawai'i Immunization Coalition and 'Imi Hale Native Hawaiian Cancer Network, as well as the local chapter of the American College of Obstetricians and Gynecologists (ACOG), also assisted with disseminating the survey through email to members. A reminder letter was sent to the providers to encourage them to complete the survey 3 months after the surveys were mailed. Participants were given the option of receiving a flash drive by mail as a token of thanks for their participation.

Data Analysis

All survey data, including hard-copy survey data were collected and managed using REDCap electronic data capture tools hosted at the University of Hawai'i at Mānoa John A. Burns School of Medicine. Variables including medical specialty, type of practice, number of years in practice, and number of patients seen in an average week were recoded to simplify categories. Statistical analyses were performed using R software, version 4.1.0 (R Foundation for Statistical Computing, Vienna, Austria). The demographics of the survey respondents were summarized by descriptive statistics and compared using Pearson's chi-square tests. To compare the characteristics of survey respondents based on willingness to send their patients to pharmacies to receive vaccinations, the data was dichotomized into 2 groups, "unwilling" and "willing" based on the survey question "Would you send your patients 11 years old and above to the pharmacist to receive his/her shots?". Univariate and multivariate logistic regression was used to understand the willingness of respondents to send patients to pharmacies for vaccines, adjusting for significant variables that included sex, medical specialty, and the number of adolescent aged patients seen in an average week. Unadjusted and adjusted odds ratios (ORs), together with their 95% confidence intervals (CIs) were determined. *P* values <.05 were considered statistically significant.

Results

The survey was sent to 398 health providers in Hawai'i, after excluding mailings that were returned to sender, 153 responses were received, with a response rate of 38%. Participants were excluded for the following reasons: 1 was not a practicing physician and 15 did not fully complete the survey. This resulted in 137 surveys for analysis.

Among the responses, 72% (n=99) of respondents were currently sending or willing to send patients ages 11 years old and above to pharmacies for vaccines while 28% (n=38) were unwilling. Responses came primarily from obstetrician-gynecologists and pediatricians **(Table 1).** While most respondents (62% (n=85) overall) were aware of the law in Hawai'i of pharmacists' role in adolescent vaccine administration, 61% (n=23) of those unwilling to send their patients to pharmacists were aware yet strongly or somewhat agreed that the law would be beneficial for their adolescent patients who are past due for the HPV vaccine. Study results also showed it is not a concern for patients to go to the same pharmacy from the physician perspective and it is easy for providers to send patients to the pharmacy of their preference. Most respondents' practice or clinics regularly stocked the HPV vaccine and indicated they were participating in the VFC program. Respondents who did not stock the vaccine cited reasons: due to the clinic not administering the vaccine, the up-front cost to purchase the HPV vaccine, lack of adequate reimbursement for HPV vaccination, and failure of some insurance companies to cover the administration of the HPV vaccination.

Among both the willing and unwilling groups, providers seemed to agree that it is important for pharmacists to have proper training in administering vaccines and monitoring for side effects, report HPV vaccine doses to primary care providers, and entering HPV vaccine doses in the state's immunization registry **(Figure 1).** After adjusting for sex, medical specialty, and number of adolescent patients seen in an average week, obstetrician-gynecologists were significantly more likely than pediatricians ($P < .001$) to send patients to pharmacies to receive vaccines [adjusted odds ratio 12.90 (95% CI 3.94-49.29)] **(Table 2).**

The main concern that 51% (n=50) of willing and 74% (n=28) of unwilling physicians felt regarding pharmacist provision of the HPV vaccine was pharmacists not reporting administered doses to a primary care provider **(Figure 2).** Other top concerns among the unwilling group were the reduction in primary care providers' opportunities to screen adolescents for mental health problems, obesity, diabetes, and other health problems, pharmacists not being properly trained in discussing sexual health and HPV transmission, and not reporting administered doses to the state's immunization registry**.** Among the willing group, 36% (n=36) of providers had no concerns.

Less than half of respondents were sending adolescent patients to the pharmacist for routine vaccinations such as HPV vaccinations at the time of the survey. In response to the survey question, "Have you sent your patients ages 11 years old and above to a pharmacist to receive his/her shots?" about 38% (n=52)

Table 1. Characteristics and Attitudes of Respondents by Willingness to Refer Patients to Pharmacies for HPV Vaccination (N = 137)

	Overall n (%)[a]	Unwilling n (%)[a]	Willing n (%)[a]	*P*-value[b]
Willingness to send patients 11 years and above to the pharmacist to receive his/her shots	137 (100%)	38 (28%)	99 (72%)	
Sex				
Male	67 (49%)	23 (61%)	44 (45%)	.102
Female	69 (51%)	15 (39%)	54 (55%)	
Medical Specialty				
Pediatrics	49 (36%)	25 (66%)	24 (24%)	<.001
Obstetrics-Gynecology	64 (47%)	6 (16%)	58 (59%)	
Other (incl Family Medicine, Internal Medicine)	24 (18%)	7 (18%)	17 (17%)	
Type of Practice or Clinic				
Private practice (incl solo, group practice, or HMO)	125 (92%)	35 (92%)	90 (92%)	.959
Non-private	11 (8%)	3 (8%)	8 (8%)	
Number of Years in Practice				
Less than 10 years	36 (26%)	9 (24%)	27 (27%)	.678
10-20 years	36 (26%)	12 (31%)	24 (24%)	
More than 20 years	65 (47%)	17 (45%)	48 (49%)	
Number of Patients Age 11 to 17 Years Seen in an Average Week				
0 patients	22 (16%)	7 (18%)	15 (15%)	.021
1-9 patients	65 (47%)	11 (29%)	54 (55%)	
10+ patients	50 (36%)	20 (53%)	30 (30%)	
Provision of Vaccinations to Adolescents Ages 11-18 Years Old				
Yes	104 (76%)	32 (84%)	72 (73%)	.159
No	33 (24%)	6 (16%)	27 (27%)	
Does Your Practice or Clinic Regularly Stock the HPV Vaccine?				
Yes	83 (63%)	27 (71%)	56 (60%)	.217
No	49 (37%)	11 (29%)	38 (40%)	
Participation in the Vaccines for Children (VFC) Program				
Yes	78 (74%)	27 (77%)	51 (72%)	.56
No	28 (26%)	8 (23%)	20 (28%)	
Have you Heard of This Law in Hawai'i?				
Yes	85 (62%)	23 (61%)	62 (63%)	.767
No	51 (38%)	15 (39%)	36 (37%)	
This Law Would Benefit 11-18 year Olds Who are Past Due for the HPV Vaccine				
Strongly or somewhat agree	116 (85%)	23 (61%)	93 (94%)	<.001
Neither disagree or agree	13 (9%)	8 (21%)	5 (5%)	
Strongly or somewhat disagree	8 (6%)	7 (18%)	1 (1%)	
How Important is it for Your Patient to Go to the Same Pharmacy?				
Very important/important	136 (100%)	37 (100%)	99 (100%)	>.999
How Easy is it for You to Send Your Patient to the Pharmacy of Their Preference?				
Very easy/easy	134 (100%)	37 (100%)	97 (100%)	>.999

[a] Totals and percentages may not equal 100% due to unanswered/missing data.
[b] Pearson's Chi-squared test

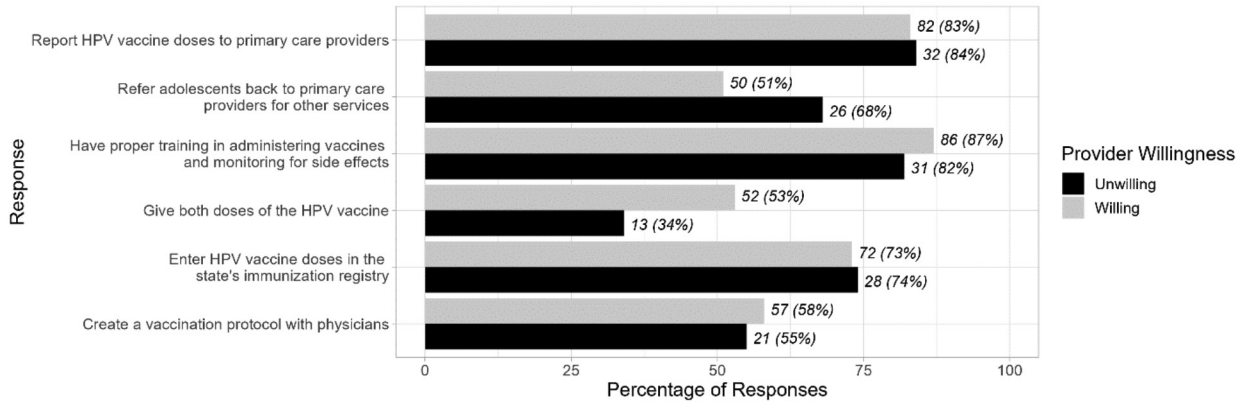

Figure 1. Perceived Benefits of the New Vaccine Law, Grouped by Providers' Willingness to Send Patients to Pharmacies for the HPV Vaccine

"Unwilling" group (n=38); "Willing" group (n=99)
Total percent does not add up to 100% exactly as respondents could select more than 1 response.

Table 2. Associations of Respondent Characteristics and Willingness to Send Patients to Pharmacies for Vaccines

	Unadjusted OR[a] (95% CI)	*P*-value	Adjusted OR[b] (95% CI)	*P*-value
Characteristics of Health Providers Surveyed				
Health Providers' Gender				
Female vs Male	1.88 [0.88, 4.10]	.104	1.09 [0.45, 2.65]	.84
Medical Specialty				
Obstetrics-Gynecologist vs Pediatrics	**10.07 [3.87, 30.00]**	**<.001**	**12.90 [3.94, 49.29]**	**<.001**
Other (incl Family Medicine, Internal Med) vs Pediatrics	2.53 [0.92, 7.55]	.081	5.65 [1.25, 31.57]	.033
Number of Patients Age 11 to 17 Years Seen in an Average Week				
1-10 vs 0 patients	2.29 [0.73, 6.90]	.142	2.84 [0.59, 13.56]	.186
10+ vs 0 patients	0.70 [0.23, 1.98]	.51	3.14 [0.62, 17.38]	.173

[a] Unadjusted odds ratio was based on simple logistic regression.
[b] Adjusted odds ratio was based on multivariable logistic regression adjusting for sex, medical specialty, and number of patients age 11 to 17 years seen in an average week.

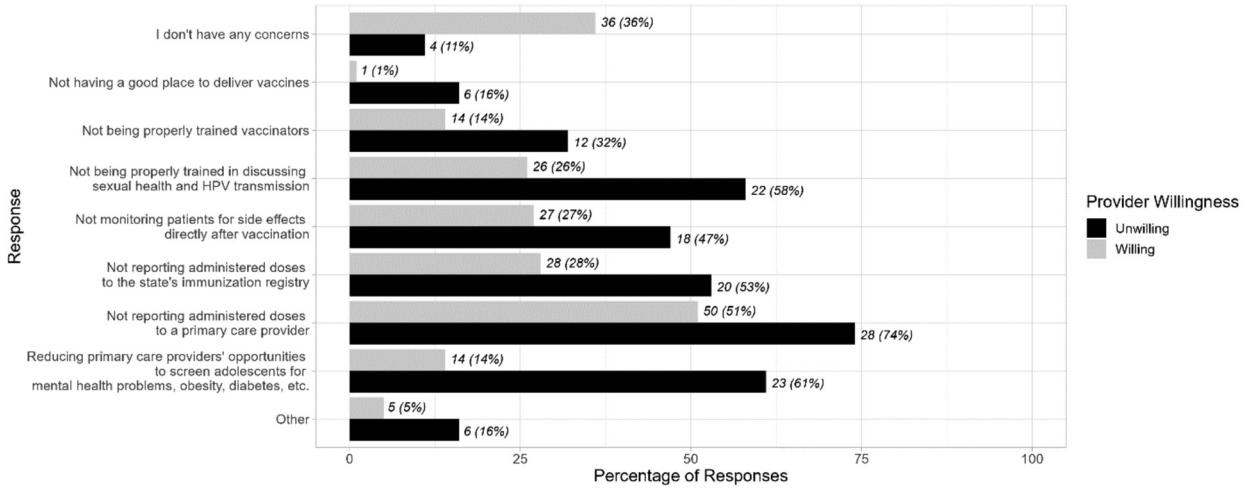

Figure 2. Concerns About HPV Vaccinations by Pharmacists, by Providers' Willingness to Send Patients to Pharmacies for the HPV Vaccine

"Unwilling" group (n=38); "Willing" group (n=99)
Total percent does not add up to 100% exactly as respondents could select more than 1 response.

of all respondents were sending their patients to a pharmacist. The most common referrals were primarily for influenza (79%, n=41), Tdap (tetanus, diphtheria, and pertussis) vaccines (46%, n=24), and HPV vaccines (38%, n=20). About 23% (n=12) of the physicians that refer their patients to pharmacies reported not knowing if their patients who were sent to the pharmacist received their shots or not. (*Data not shown.)*

Discussion

Overall, most of the physicians surveyed felt that pharmacists' administration of the HPV vaccine would be beneficial for their patients. Results showed 62% (n=85) were aware of the Hawai'i law of pharmacists' role in adolescent vaccine administration, which was higher than expected. Similarly, a national survey among physicians on their perspectives of adult vaccine delivery found that physicians view pharmacists' role as vaccinators helpful.[19] However, the current study hypothesis that physicians were underutilizing this law to refer their adolescent and older patients to pharmacies was consistent with findings that only about 38% (n=52) were sending their patients to a pharmacist at the time of the study. Patients were primarily sent to pharmacists for influenza vaccines rather than for HPV vaccines. The state of Hawai'i vaccination coverage remains lower than the national Healthy People 2030 goal for adolescent males and females despite most of the respondents regularly stocking the HPV vaccine; and providers who do not regularly stock the HPV vaccine have the opportunity to send their patients to the pharmacy as an alternative.

Although physicians felt that the legislation change was beneficial, it seemed that physicians were less likely to refer patients to a pharmacy or retail store to receive vaccinations both nationally and locally.[19] Results from this study echoed the concern from a national discussion of pharmacies impacting a patient's primary care because it would reduce their opportunities to screen for health problems.[20] A past study found that physicians in Hawai'i feel that discussing sexual health is important when recommending and administering the HPV vaccine, which may be the reason why some respondents felt that pharmacists may not be properly trained in this area.[12] Since most pediatricians carry the HPV vaccine, they could provide HPV vaccine education, including discussing sexual health, to the patient, administer the first HPV shot and prescribe remaining doses to a pharmacy for completion.

Another common concern of this study and of a similar study[19] is physicians not receiving documentation of vaccinations completed at the pharmacy. This is an important practice for primary care providers as it is difficult to provide vaccine recommendations if a patient's comprehensive vaccine history is unknown.[20] Physicians may not be aware that a standard procedure for pharmacists' post-vaccination includes faxing or notifying the clinic that their patient was recently vaccinated. Pharmacists should also ensure that vaccine administration information is entered into a state immunization information system and if permitted, the patient's medical record. Ensuring an accessible, up-to-date immunization registry should also be a priority for state and territorial health departments. Caregivers and patients could also be encouraged to carry immunization record cards for their own records. Further training on patient education and providing both pharmacists and physicians locally made informational pamphlets about the vaccine and HPV transmission that patients and parents are receptive to may help improve HPV vaccine administration at pharmacies and reduce missed doses.[10]

Limitations

The limitations of this study include the low response rate, which could result in non-response bias, and the convenience sample, which could create a sampling bias. Despite the use of Cochrane methods, such as using incentives and short questionnaires to improve response rates, this study's response rate was not high.[21] It is difficult to determine the true denominator because surveys were distributed via both email and hard copy, and sent to several community-based organizations with possibly duplicating memberships. Nearly half of the survey respondents were obstetrician-gynecologists and may differ from the lesser-represented respondents from the pediatric and family medicine specializations. Active members from a professional medical society are assumed to be more updated with practice changes which may influence their attitudes and practices in comparison to non-members. Also, this study specifically surveyed obstetrics-gynecologists, pediatricians, and other primary care physicians belonging to primarily private practices, leaving out other providers that may also administer vaccinations to adolescents. This study would benefit from being repeated in the present day as policies including school-based vaccine requirements have changed since the time period that the survey was administered. Even with these limitations, the study provides a sense of how willing most health providers are to collaborating with pharmacists for vaccine administration.

Conclusion

Due to the high susceptibility and disease risks associated with HPV, it is important for children to receive the HPV vaccine especially in the ACIP-recommended ages. With the 2017 legislation change in Hawai'i allowing pharmacies to become a venue for adolescent vaccine administration, patients have more options to receive and complete the vaccine series. By fulfilling knowledge gaps of this legislation change among physicians, potentially more patients can be referred to pharmacies increasing HPV vaccine uptake in the state. Increased partnership in trainings and communication of completed vaccines between pharmacies and physician offices and in a well-maintained vaccine registry may facilitate better collaboration between pharmacists and physicians in addressing concerns, and may streamline the process of referring patients to pharmacies. This

would allow patients more opportunities to access vaccines and ultimately improve the health opportunities of children and adolescents in the state of Hawai‘i.

Conflict of Interest

None of the authors identify a conflict of interest.

Acknowledgements

MR and JJC were partially supported by the U54MD007601 (Ola HAWAII) grant from the National Institute of Health (NIH). The content is solely the responsibility of the authors and does not necessarily represent the official views of NIH. Thank you to Dr. May Rose Dela Cruz and Dr. John J. Chen for being my mentors, and Dr. Reni Soon and Dr. Carolyn Ma for their support and insight in developing this study.

Authors' Affiliations:
- Department of Quantitative Health Sciences, John A. Burns School of Medicine, University of Hawai‘i, Honolulu, HI (MR, JJC)
- Office of Public Health Studies, Thompson School of Social Work & Public Health, University of Hawai‘i at Mānoa, Honolulu, HI (MRDC)
- Department of Obstetrics, Gynecology, and Women's Health, John A. Burns School of Medicine, University of Hawai‘i, Honolulu, HI (RS)
- Daniel K. Inouye College of Pharmacy, University of Hawai‘i at Hilo, Hilo, HI (CM)

Corresponding Author:
Meliza Roman MS; Email: melizar@hawaii.edu

References

1. Lewis RM, Laprise JF, Gargano JW, et al. Estimated prevalence and incidence of disease-associated human papillomavirus types among 15- to 59-year-olds in the United States. *Sex Transm Dis*. 2021;48(4):273-277. doi:10.1097/OLQ.0000000000001356
2. Centers for Disease Control and Prevention (CDC). Human papillomavirus-associated cancers - United States, 2004-2008. *MMWR Morb Mortal Wkly Rep*. 2012;61:258-261. Accessed December 10, 2021. https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6115a2.htm
3. Saraiya M, Unger ER, Thompson TD, et al. US assessment of HPV types in cancers: implications for current and 9-Valent HPV vaccines. *JNCI J Natl Cancer Inst*. 2015;107(6):djv086. doi:10.1093/jnci/djv086
4. Gillison ML, Chaturvedi AK, Lowy DR. HPV prophylactic vaccines and the potential prevention of noncervical cancers in both men and women. *Cancer*. 2008;113(10 Suppl):3036-3046. doi:10.1002/cncr.23764
5. Meites E, Kempe A, Markowitz LE. Use of a 2-dose schedule for human papillomavirus vaccination - updated recommendations of the Advisory Committee on Immunization Practices. *MMWR Morb Mortal Wkly Rep*. 2016;65(49):1405-1408. doi:10.15585/mmwr.mm6549a5
6. Meites E, Szilagyi PG, Chesson HW, Unger ER, Romero JR, Markowitz LE. Human papillomavirus vaccination for adults: updated recommendations of the Advisory Committee on Immunization Practices. *Morb Mortal Wkly Rep*. 2019;68(32):698-702. doi:10.15585/mmwr.mm6832a3
7. Increase the proportion of adolescents who get recommended doses of the HPV vaccine — IID-08. Healthy People 2030 Website. Published 2020. Accessed December 11, 2021. https://health.gov/healthypeople/objectives-and-data/browse-objectives/vaccination/increase-proportion-adolescents-who-get-recommended-doses-hpv-vaccine-iid-08
8. Pingali C, Yankey D, Elam-Evans LD, et al. National, regional, state, and selected local area vaccination coverage among adolescents aged 13–17 years — United States, 2020. *Morb Mortal Wkly Rep*. 2021;70(35):1183-1190. doi:10.15585/mmwr.mm7035a1
9. U.S. Department of Health and Human Services (DHHS), National Center for Immunization and Respiratory Diseases. TeenVaxView | Adolescent Vaccine Coverage Interactive Data | NIS | CDC. Centers for Disease Control and Prevention Website. Published May 14, 2021. Accessed December 11, 2021. https://www.cdc.gov/vaccines/imz-managers/coverage/teenvaxview/data-reports/index.html
10. Dela Cruz MRI, Tsark JAU, Soon R, Albright CL, Braun KL. Insights in public health: community involvement in developing a human papillomavirus (HPV) vaccine brochure made for parents in Hawai'i. *Hawaii J Med Public Health*. 2016;75(7):203-207. Accessed February 16, 2018. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4950096/
11. Dela Cruz MRI, Braun KL, Tsark JAU, Albright CL, Chen JJ. HPV vaccination prevalence, parental barriers and motivators to vaccinating children in Hawai'i. *Ethn Health*. 2020;25(7):982-994. doi:10.1080/13557858.2018.1473556
12. Soon R, Dela Cruz MRI, Tsark JU, Chen JJ, Braun KL. A survey of physicians' attitudes and practices about the human papillomavirus (HPV) vaccine in Hawai'i. *Hawaii J Med Public Health*. 2015;74(7):234-241. Accessed February 16, 2018. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4507363/
13. Tom A, Robinett H, Buenconsejo-Lum L, et al. Promoting and providing HPV vaccination in Hawaii: barriers faced by health providers. *J Community Health*. 2016;41(5):1069-1077. doi:10.1007/s10900-016-0191-9
14. Kahn JA, Rosenthal SL, Tissot AM, Bernstein DI, Wetzel C, Zimet GD. Factors influencing pediatricians' intention to recommend human papillomavirus vaccines. *Ambul Pediatr Off J Ambul Pediatr Assoc*. 2007;7(5):367-373. doi:10.1016/j.ambp.2007.05.010
15. *Health Act 068 (17), Hawaii State Law §461-11.4 Vaccinations; Children*.; 2017. Accessed September 15, 2021. https://www.capitol.hawaii.gov/hrscurrent/vol10_ch0436-0474/HRS0461/HRS_0461-0011_0004.htm
16. Islam JY, Gruber JF, Lockhart A, et al. Opportunities and challenges of adolescent and adult vaccination administration within pharmacies in the United States. *Biomed Inform Insights*. 2017;9:1178222617692538. doi:10.1177/1178222617692538
17. Gilkey MB, Malo TL, Shah PD, Hall ME, Brewer NT. Quality of physician communication about human papillomavirus vaccine: findings from a national survey. *Cancer Epidemiol Biomark Prev Publ Am Assoc Cancer Res Cosponsored Am Soc Prev Oncol*. 2015;24(11):1673-1679. doi:10.1158/1055-9965.EPI-15-0326
18. VFC: Vaccines for Children Program | CDC. Centers for Disease Control and Prevention (CDC). Published October 24, 2022. Accessed February 4, 2023. https://www.cdc.gov/vaccines/programs/vfc/index.html
19. Hurley LP, Bridges CB, Harpaz R, et al. U.S. physicians' perspective of adult vaccine delivery. *Ann Intern Med*. 2014;160(3):161. doi:10.7326/M13-2332
20. Rothholz M, Tan LLJ. Promoting the immunization neighborhood: benefits and challenges of pharmacies as additional locations for HPV vaccination. *Hum Vaccines Immunother*. 2017;13(8):1856-1858. doi:10.1080/21645515.2016.1176651
21. Edwards PJ, Roberts I, Clarke MJ, et al. Methods to increase response to postal and electronic questionnaires. *Cochrane Database Syst Rev*. 2009;(3):MR000008. doi:10.1002/14651858.MR000008.pub4