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Improving knowledge and awareness of HPV-associated gynecologic cancers: results from the National Comprehensive Cancer Control Program/*Inside Knowledge* collaboration

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Abstract

Background: Over 16,000 women are diagnosed with a human papillomavirus (HPV)-associated gynecologic cancer every year. Because most of these cancers are preventable, correct and appropriate information about the HPV vaccine and cervical cancer screening can help reduce incidence.

Methods: The Centers for Disease Control and Prevention created *Inside Knowledge: Get the Facts About Gynecologic Cancer* campaign materials, which were used by seven National Comprehensive Cancer Control Program (NCCCP) recipients in tailored educational sessions on gynecologic cancer with women and health care providers in the community setting. Session participants completed pre- and post-session questionnaires. Differences in knowledge and intentions were assessed using chi square tests for women in the general public, obstetricians/gynecologists (OB/GYNs), primary care physicians (PCPs), and other health care providers.

Results: Women's knowledge improved significantly pre- to post-session that HPV causes vaginal (39% to 65%, $p < 0.001$) and vulvar cancers (26% to 60%, $p < 0.001$), but post-session few women correctly identified all HPV-associated gynecologic cancers (15%). From pre- to post-session, more women were able to correctly identify recommended age groups for whom the HPV vaccine is recommended (15% to 30%, $p < 0.001$), and that the Pap test only screens for cervical cancer (58% to 73%, $p < 0.001$). Among providers, OB/GYNs had more baseline knowledge of HPV-associated gynecologic cancers than other providers. Post-session, PCPs and other providers increased their knowledge of HPV vaccine recommended age groups (33% to 71% and 23% to 61%, respectively), and the three-year recommended screening interval for the Pap test (73% to 91% and 63% to 85%, respectively). HPV vaccine knowledge did not show significant improvement among OB/GYNs post-sessions.

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Conclusions: Women and health care providers who attended the *Inside Knowledge* sessions significantly improved their knowledge of HPV-associated gynecologic cancers. Additional educational activities during the sessions that support distinguishing between HPV-associated versus other gynecologic cancers and clarify HPV vaccine recommendations may help with further increases in knowledge.

Keywords

human papillomavirus vaccine; Public Health Practice; neoplasms/prevention and control; cancer control; Papillomavirus Infections/*diagnosis/*prevention & control; Uterine Cervical Neoplasms; Cancer Screening

Introduction:

Annually, over 16,000 U.S. women are diagnosed with a human papillomavirus (HPV)-associated gynecologic cancer.[1] The majority of HPV-associated gynecologic cancers are cervical cancer, which are preventable with vaccination and screening. HPV is associated with vaginal and vulvar cancers, as well as non-gynecologic cancers that include anal, oropharyngeal, and penile cancers in men. With the advent of the Papanicolaou (Pap) test, cervical cancer mortality sharply decreased in the US. [2–4] However, nearly 4,100 women in the U.S still die of this disease every year, [5] and prevalence of screening with the Pap test has not met the Healthy People 2020 objective of 93%.[6] HPV causes over 90% of cervical cancers, 75% of vaginal cancers, and 69% of vulvar cancers.[7] Since 2006, with the licensure of the first quadrivalent HPV vaccine, many HPV-associated cancers are now preventable. [8] The potential to prevent more types of virulent HPV became available with the Food and Drug Administration's licensure and Advisory Committee for Immunization Practices' (ACIP) recommendation for use a 9-valent vaccine in 2015.[9] Although it may take several decades to assess the full impact of the HPV vaccine on the burden of HPV-associated gynecologic cancers, early evidence suggests a decrease in HPV prevalence among vaccinated women in the US.[10] Vaccine coverage is increasing but continues to remain low among adolescent females and males aged 13 – 17 years, with at least one-dose coverage of 65% and 56% in 2016, respectively; the full potential of this vaccine will not be realized until coverage levels increase.[11]

For vulvar and vaginal cancers, no effective screening test exists. However, both cancers present with symptoms such as bleeding in vaginal cancer and itching and inflammation with vulvar cancer, providing an opportunity for diagnosis at an early stage. [12, 13] Therefore, women and their health care providers need to be informed that persistent symptoms need assessment by a physician. [14] To address this need, the Centers for Disease Control and Prevention (CDC) and the Office on Women's Health have implemented the *Inside Knowledge* campaign to raise awareness of the five main types of gynecologic cancers and their signs and symptoms. [15, 16] In 2014, CDC provided additional support to seven National Comprehensive Cancer Control Program (NCCCP) recipients to plan and lead *Inside Knowledge* educational sessions with health care providers and women in the community. [17, 18] Routine activities of all NCCCP funding recipients (n=66) include development and implementation of specific plans in conjunction with partners and stakeholders. [19, 20]

NCCCP access to local partners and underserved populations provided an ideal opportunity to implement these additional community-based educational sessions for women and health care providers.

In this study, we assessed pre- and post-session knowledge of HPV-associated gynecologic cancer signs and symptoms, risk factors, and preventive measures among women and health care providers attending educational sessions in six states and Puerto Rico.

Methods

The development of *Inside Knowledge* campaign educational sessions has been described elsewhere. [17] Briefly, the educational sessions were developed using multiple health promotion learning theories designed to increase knowledge and intentions. Participating NCCCP grantees in Alaska, Michigan, New Jersey, Puerto Rico, Tennessee, West Virginia, and Wisconsin recruited women and health care providers through a variety of mechanisms, such as newspaper ads, email listservs, social media and other avenues. Grantees were chosen based on cancer burden and desire to participate in this study. Educational sessions were conducted in a standardized format led by facilitators who used various approaches tailored to the local population to present the *Inside Knowledge* materials. For example, sessions in Alaska used a storytelling approach to appeal to Alaska Native women. Women visited gynecologic cancer information stations that were hosted by health care professionals who engaged in conversations with women over the offered materials. In Puerto Rico, sessions were held in Spanish using Spanish-language *Inside Knowledge* materials. Sessions were held separately for health care providers (mainly primary care physicians (PCPs) and obstetricians/gynecologists (OB/GYNs)) and women in the community (i.e. public sessions). CDC determined this study exempt from requiring Institutional Review Board Approval (IRB) review. The information collected in this study was approved by the US Office of Management and Budget (approval number 0920–0800). Informed consent was obtained from all participants as part of OMB regulations.

Each participant completed pre- and post-session questionnaires that assessed knowledge, awareness, confidence with using the newly received information, and any resulting behavioral intentions. Survey items included closed-ended single and multiple choice questions; Likert scale responses (five-point scales) for agreement, likeliness, and confidence with taking specific actions for prevention and early detection of gynecologic cancer; and a few open-ended response options designed to capture other responses (e.g. provider type). Due to confidentiality concerns, participants' personal identifiers were not collected, and therefore pre- and post-session surveys were not individually-linked. After the sessions, completed surveys were uploaded into Snap Survey software, and individual, deidentified surveys were labeled as either being from the pre-session or the post-session. All data were assessed for quality before any analyses were undertaken.

Variables of interest in this study included demographic characteristics of session participants, such as age, educational level, and race/ethnicity for public session attendees; and age, race/ethnicity, provider specialty, and work setting for providers. We grouped providers as obstetricians/gynecologists (OB/GYNs), primary care physicians (PCPs, which

included family medicine, internal medicine, general practice, and pediatrics), and other health care providers (nurses, physician's assistants, and other providers). Health care providers who did not provide a specialty or professional designation were excluded from the analysis. Among public session attendees, we assessed knowledge of HPV-associated gynecologic cancers (including screening and HPV vaccine knowledge), signs and symptoms, risk factors, and confidence with using the newly learned information. We collapsed some categories of demographic variables (e.g. age) to protect confidentiality. Because of infrequent responses on certain five-point Likert scale items, categories were collapsed to dichotomous responses of "extremely confident/somewhat confident" versus all other categories, and "extremely likely/somewhat likely" versus all other categories. Denominators excluded missing responses and respondents who selected "does not apply." Similar data were collected from providers, but some questions were more specific, such as the specific signs and symptoms of certain gynecologic cancers. Although the educational sessions covered material on all gynecologic cancers, we focused our analysis on questions related only to HPV-associated gynecologic cancers.

We calculated descriptive statistics on participant demographic characteristics, knowledge, intentions, and awareness. We compared pre- and post-session knowledge and intentions using chi square tests. SAS version 9.3 (SAS Incorporated, Cary, NC) was used to conduct all analyses.

Results

Participant characteristics:

Public—Most women attending the public *Inside Knowledge* sessions were over age 45, either white or Hispanic/Latino, and a little over half were college graduates (Table 1). Among public session attendees, awareness of HPV-associated gynecologic cancer was highest for cervical cancer (95%), and lowest for vulvar cancer (42%).

Provider—Nearly half of OB/GYNs and a third of other providers were over age 55, while a slight majority of PCPs were younger than age 45 (Table 2; $p < 0.001$). Nearly 60% of OB/GYNs were males, while most PCPs and other providers were female ($p < 0.001$). OB/GYNs were overwhelmingly Hispanic/Latino from Puerto Rico, while most PCPs were either Hispanic/Latino or white, and over 60% of other providers were white ($p < 0.001$). OB/GYNs commonly worked in both inpatient and outpatient settings and saw a higher volume of patients (over 20 per day), while PCPs and other providers typically worked in outpatient settings ($p < 0.001$) and saw fewer patients per day ($p < 0.001$).

Differences in knowledge, attitudes, and behavioral intentions

Public—From pre- to post-session, women's knowledge of HPV and its associated cancers improved (table 3). In the pre-session, 91% of public session attendees correctly identified that HPV was associated with cervical cancer. Knowledge improved to 65% for vaginal cancer ($p < 0.001$) and 60% for vulvar cancer ($p < 0.001$) post-session, but only 15% of public session attendees post-session correctly identified all three HPV-associated

gynecologic cancers among other answer choices. Post-session, nearly all women (97%) correctly identified smoking as a risk factor for cervical cancer ($p < 0.001$).

Among public session attendees, knowledge of specific symptoms of HPV-associated gynecologic cancer, such as changes in bathroom habits ($p < 0.001$), vulvar itching/burning ($p < 0.001$), or color changes ($p < 0.001$), improved considerably post-session.

Public session attendees increased their knowledge of HPV vaccine recommendations, particularly for 11 – 12 year old girls (from 50% to 66%, $p < 0.001$; Table 4), but more attendees correctly identified the vaccine catchup age group of adolescents and women aged 13 – 26 years (from 62% to 77%; $p < 0.001$). However, few could correctly identify all recommended age groups from other answer choices, although knowledge did improve post-session (15% to 30%; $p <0.001$).

Public session attendees also improved their knowledge about testing for HPV associated cancer. For cervical cancer screening, more women pre- to post-session recognized that only cervical cancer has an effective screening test (67% to 77%; $p= 0.001$), and that the Pap test only screens for cervical cancer (58% to 73%; $p <0.001$) and not for vaginal cancer (77% to 86%; $p < 0.001$). Although knowledge did improve, only about a third of public session attendees post-session knew that genetic testing was not available for HPV-associated cancers ($p=0.02$).

Post-session, public session attendees also reported positive intentions to reduce their risk for HPV associated cancer (Table 5), such as quitting smoking (76%; $p=0.03$), obtaining the HPV vaccine if age-eligible (100%; $p < 0.001$), and getting regular Pap tests (93%; $p=0.03$).

Providers—OBGYNs had more baseline knowledge of HPV than PCPs and other providers, and post-session, their knowledge improved only for HPV as a cause of vaginal cancer (from 73% to 85%; $p=0.04$; table 3). Knowledge improved among other providers for vaginal ($p <0.001$) and vulvar cancers ($p=0.001$). Seventy-four percent of OB/GYNs, but only 52% of PCPs and 33% of other providers correctly identified all HPV-associated cancers post-session. Post-session, OB/GYNs (89%; $p = 0.01$) and other providers (88%; $p= 0.001$) improved their knowledge and more often correctly identified abnormal bleeding as a symptom of cervical cancer than PCPs (72%; $p=0.25$). Both OB/GYNs and other providers improved their recognition of abnormal bleeding as a symptom of vaginal cancer (67%, $p= 0.002$ and 76%, $p < 0.001$; respectively), while PCPs did not (58%; $p=0.21$). Post-session, only 52% of OB/GYNs correctly identified that the HPV vaccine was recommended for 11 – 12 year old adolescents, and knowledge did not improve from the pre-session questionnaire (48%; $p=0.51$). Both PCPs and other providers improved their knowledge of HPV vaccine recommended age groups, with 71% of PCPs ($p= 0.002$) and 61% of other providers ($p < 0.001$) choosing all correct response options in the post-session. Both groups improved their knowledge by nearly 38 percentage points over the pre-session.

Most providers correctly identified that only cervical cancer has an effective screening test, and there was little variation in correct responses among provider types in the post-session results (range: 84% - 87%). Post-session, only 72% of OB/GYNs answered that it was

appropriate to give the Pap test every three years, but PCPs (73% to 91%; p=0.01) and other providers (63% to 85%; p <0.001) greatly increased their pre- to post-session knowledge on this question. Other providers improved their knowledge post-session that the Pap test only screens for cervical cancer (86%; p=0.003), which was slightly higher than correct responses given by OB/GYNs (76%) and PCPs (79%) post-session. While the vast majority of providers recognized that the Pap test does not screen for vaginal cancer (82% for PCPs and 91% for other providers), only 77% of OB/GYNs provided a correct post-session response.

Providers reported feeling more confident that they had enough information to inform patients about HPV-associated cancers. These finding were most striking among PCPs and other providers, particularly for vaginal and vulvar cancers. Percentage point increases pre- to post-session ranged from 55% to 82% among PCPs reporting improved confidence with vaginal cancer (p=0.001) to an increase from 42% to 87% among other providers with improved confidence to address vaginal cancer (p < 0.001).

Discussion:

In this study, knowledge about HPV-associated gynecologic cancers improved among public session attendees and health care providers after attending the *Inside Knowledge* educational sessions. Notably, public session attendees improved their knowledge about HPV-associated gynecologic cancers, recommended age groups for the HPV vaccine, knowledge about cervical cancer screening, and signs and symptoms of HPV-associated gynecologic cancers. Afterwards, public session attendees more frequently reported intentions to quit smoking, get the HPV vaccine (if age-eligible), and obtain regular Pap tests.

However, some notable knowledge gaps remain. Although knowledge of HPV-associated gynecologic cancers improved, only 15% of public session attendees correctly identified all three HPV-associated gynecologic cancers post-session, and fewer were aware that HPV causes vaginal (65%) and vulvar cancers (60%). Only 30% of public session attendees correctly answered the question on HPV vaccine recommendations. These findings suggest lack of knowledge among women that multiple HPV-associated gynecologic cancers do exist, and these cancers are potentially preventable through recommended use of the HPV vaccine in the adolescent boys and girls. Mothers and grandmothers of adolescents may be an important population to target in future *Inside Knowledge* efforts to help alleviate the ongoing misperceptions about the vaccine [21–23] and increase their knowledge that the HPV vaccine helps prevent multiple gynecologic cancers. [24]

In general, knowledge about HPV-associated gynecologic cancers improved among health care providers after attending the *Inside Knowledge* educational sessions. OB/GYNs had more baseline knowledge of HPV-associated gynecologic cancers, and their knowledge regarding HPV infection as a risk factor for vaginal cancer improved post-session. PCPs and other providers greatly increased their knowledge of HPV vaccine recommended age groups, and the three-year recommended screening interval for the Pap test. Post-session, confidence improved among all providers about their ability to provide information to patients about cervical, vaginal, and vulvar cancers. OB/GYNs expressed the highest levels

of confidence, with 97% - 100% of OB/GYNs confident about providing information to patients on vulvar, vaginal, and cervical cancers.

Post-session, slightly over half of primary care physicians correctly identified all HPV-associated gynecologic cancers, and only a third of other providers did. These findings are similar to the findings among women, and indicate a need to improve recognition of HPV as a causative agent for specific gynecologic cancers. This is particularly important given that PCPs and other providers are more likely to encounter adolescent patients and their parents and have discussions about HPV-associated cancers and the HPV vaccine. [25, 26] Knowledge regarding HPV vaccine recommendations did not improve among OB/GYNs, and only about 30% correctly identified all vaccine-recommended age groups among a set of response options that included incorrect answer choices such as post-menopausal women or all sexually active women. Post-session, only a little over 50% of OB/GYNs recognized that the vaccine is recommended for 11 – 12 year olds. Although OB/GYNs are unlikely to routinely see adolescent patients, they can have a role in promoting the HPV vaccine by educating mothers of adolescents and administering a catch-up vaccination schedule to unvaccinated or under-vaccinated women under 26 years of age. [27] Given that many OB/GYNs do offer the HPV vaccine to eligible patients, [28] the American College of Obstetrics and Gynecology (ACOG) developed an HPV vaccine toolkit developed for use with OB/GYNs (http://immunizationforwomen.org/toolkit/hpv). Therefore, it is critical that OB/GYNs be included in efforts to educate health care providers about the HPV vaccine and how to make a strong recommendation for its use.

Unexpectedly, PCPs and other providers slightly outperformed OB/GYNs in recognizing that the Pap test only screens for cervical cancer and the recommended screening interval for the Pap test is three years if a woman's test results are normal. This may reflect our population of OB/GYN providers who were mostly from Puerto Rico, some of whom may have concerns about women being lost-to-follow up after an abnormal test, or who may not come in for screening at all. [29] Some OB/GYNs believe that the Pap test can on some occasions detect vaginal cancer, and women who have undergone hysterectomy for invasive cervical cancer or who have a history of diethylstilbestrol exposure or cervical intraepithelial neoplasia 2 (CIN2) or CIN3 prior to their hysterectomy may continue to receive cervical cancer screening, even though data on benefits of continuing screening to prevent vaginal cancer are sparse. [2, 30, 31] Joint guidelines on cervical cancer screening from the American Cancer Society, American Society of Colposcopy and Cervical Pathology, and the American Society of Clinical Pathology advise against screening for vaginal cancer in women who have undergone a hysterectomy and have no history of CIN2+.[31] This recommendation is also supported by ACOG in its cervical cancer screening guidelines, [3] and the United States Preventive Services Task Force has issued a D rating (i.e. discouraged use) for this practice. [2] A systematic review found little supporting evidence for continuing screening among women with hysterectomies for benign or precancerous disease due to poor study designs and the rarity of vaginal cancer, [32] and one study reported a very low positive predictive value. [33] Future efforts that educate all physicians in the U.S. and its affiliated territories about these particular recommendations may increase adherence.

In a recent national survey, a minority of OB/GYNs said they preferred annual Pap tests, even though current screening recommendations specify a three-year interval. [28] Traditionally, annual Pap tests were intertwined with annual well woman exams, and many insurers continue to cover annual Pap tests, while some providers are responding to patients' concerns and insistence that they need annual Pap tests, or that patients will skip annual wellness visits without an accompanying Pap test. [28, 34, 35] Other concerns involve the risk of potential malpractice claims, health systems' measurement of performance that do not align with current guidelines, and the extra time required to explain to patients the benefits and harms of screening. [36] These concerns lead many providers to screen annually, even though they acknowledge and accept extended screening intervals. [28, 35] Additionally, many women report being screened annually, and a slight majority express a preference for an annual test. [37–39] However, some women on an annual Pap schedule may be referred for procedures to remove CIN1 or CIN2 lesions that likely would have regressed without intervention, and screening recommendations acknowledge the safety of a three-year screening interval.[2] Therefore, future educational efforts may clarify these issues and provide information about the benefits and risks of screening, particularly with women of reproductive age who would be at higher risk for preterm birth due to invasive procedures to remove CIN1 or CIN2 lesions. [31]

This study does have some limitations. First, due to social desirability, some women may over-report intentions to quit smoking or receive regular Pap tests. Second, pre- and post-session questionnaires were not linked at the individual participant level because of privacy concerns, so we could not assess individual level improvements in knowledge and intentions. Third, the HPV vaccine questions focused on females only, even though since 2011, the ACIP vaccine recommendations include adolescent boys and young men. [9, 40] This may have led to confusion among providers with current knowledge of HPV vaccine recommendations. Fourth, we did not assess knowledge of HPV co-testing even though *Inside Knowledge* materials address this topic, nor did we include discussion of other HPV-associated cancers (oropharyngeal, anal, and penile) that affect both women and men. Fifth, nearly 90% of OB/GYNs attending the *Inside Knowledge* sessions were from Puerto Rico because they had attended a women's preventive medicine conference for OB/GYNs that included this educational session. Therefore, our findings may not apply to OB/GYNs working in the mainland US. Finally, we did not account for chance statistically significant findings arising from multiple comparisons. However, this study does have notable strengths. All sessions were conducted in community settings and included women from underserved and underrepresented populations located in diverse geographic areas across the US, thus demonstrating knowledge and intentions regarding HPV-associated gynecologic cancers can be improved among women at increased risk for gynecologic cancer. The sessions were also effective for many providers in improving knowledge regarding HPV-associated gynecologic cancers and HPV vaccine recommendations.

Knowledge and awareness among women and their providers are key to early detection. In future educational efforts, more emphasis may be needed on rarer types of gynecologic cancer, particularly when educating PCPs who may be the first provider with whom older women consult regarding gynecologic symptoms. Additionally, grouping gynecologic cancers in discussions and print materials as either HPV-associated (cervical, vaginal,

vulvar) or non HPV-related (ovarian, uterine) may help with risk factor identification and symptom recognition. Exploring the effectiveness of this delineation between HPV-associated gynecologic cancers versus those that are not related to HPV (ovarian and uterine) will be helpful.

In conclusion, the *Inside Knowledge* educational sessions significantly increased knowledge and intentions among both women and providers about HPV-associated gynecologic cancers. This is important because approximately half of women diagnosed with cervical cancer have rarely or never been screened.[41] Additionally, continued monitoring of cervical cancer screening consistent with current recommendations among all providers will assist with planning future targeted educational efforts in this area. Future educational efforts could include more pediatricians in the educational sessions, as they are often the providers who see young patients who are eligible to receive the HPV vaccine. Finally, discussing local cervical screening practices and addressing providers' concerns about screening recommendations during the educational sessions may help improve knowledge that is consistent with evidence-based practices.

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Table 1.

Demographic characteristics of women attending the public Inside Knowledge education sessions

	Public, N=499
	n (%)
Age	
< 25 years	29 (6.0)
< 25 – 34 years	58 (12.0)
35–44 years	71 (14.7)
45–54 years	105 (21.7)
55–64 years	113 (23.4)
65+ years	108 (22.3)
Race/Ethnicity	
Hispanic/Latino	177 (37.2)
American Indian/Alaska Native	16 (3.4)
Asian/Native Hawaiian/Pacific Islander	9 (1.9)
African-American	70 (14.7)
white/Caucasian	194 (40.8)
Multiple race/other	10 (2.1)
Education level	
Some high school or less	22 (4.7)
High school graduate/GED	68 (14.6)
Some college	126 (27.0)
College graduate and above	241 (51.8)
Other	9 (1.9)
Awareness of cervical cancer	453 (94.6)
Awareness of vaginal cancer	322 (67.2)
Awareness of vulvar cancer	202 (42.2)

Denominators exclude missing responses

Table 2.

Demographic characteristics of providers attending the Inside Knowledge education sessions

	Providers			
	Obstetrician-gynecologist, N=106	Primary care, N=64	Other, N=200	
	n (%)	n (%)	n (%)	*P* value[a]
Age				
< 35 years	15 (14.6)	18 (31.6)	33 (16.8)	<0.001
35–44 years	13 (12.6)	12 (21.1)	34 (17.3)	
45–54 years	25 (24.3)	10 (17.5)	60 (30.5)	
55–64 years	29 (28.2)	12 (21.1)	63 (32.0)	
65+ years	21 (20.4)	5 (8.8)	7 (3.6)	
Gender				
Male	62 (59.1)	16 (30.8)	7 (3.5)	<0.001
Female	43 (41.0)	36 (69.2)	193 (96.5)	
Race/Ethnicity				
Hispanic/Latino	94 (90.4)	27 (45.8)	26 (13.1)	<0.001
Asian/Native Hawaiian/Pacific Islander	1 (1.0)	3 (5.1)	22 (11.1)	
African-American	1 (1.0)	1 (1.7)	23 (11.6)	
white/Caucasian	8 (7.7)	26 (44.1)	124 (62.6)	
Multiple race/other	0 (0)	2 (3.4)	3 (1.5)	
Work Environment				
Inpatient	2 (1.9)	0 (0.0)	22 (11.7)	<0.001
Outpatient	29 (28.2)	31 (53.5)	94 (50.0)	
Combination(inpatient/outpatient)	70 (68.0)	20 (34.5)	22 (11.7)	
School	0	0 (0.0)	27 (14.4)	
Other	2 (1.9)	7 (12.1)	23 (12.2)	
Average Patients seen per day				
<10	7 (6.8)	5 (8.6)	53 (28.8)	<0.001
10–20	32 (31.1)	29 (50.0)	55 (29.9)	
21–30	37 (35.9)	12 (20.7)	34 (18.5)	
31–40	21 (20.4)	7 (12.1)	17 (9.2)	
41+	5 (4.9)	4 (6.9)	15 (8.2)	
Not Sure	1 (1.0)	1 (1.7)	10 (5.4)	

[a] $p < 0.05$ from chi square tests or Fisher's exact test

Denominators exclude missing responses. Providers who did not report their specialty or their professional designation are excluded from this analysis.

Table 3.

Knowledge and awareness of risk factors and symptoms of HPV associated cancer

				Provider								
Question	Public, N=499			Obstetrician-gynecologist, N=106			Primary care, N=64			Other, N=200		
	Pre session knowledge n (%)	Post session knowledge n (%)	*P* value[a]	Pre session knowledge n (%)	Post session knowledge n (%)	*P* value[a]	Pre session knowledge n (%)	Post session knowledge n (%)	*P* value[a]	Pre session knowledge n (%)	Post session knowledge n (%)	*P* value[a]
Risk factors												
HPV causes cervical cancer	419 (90.9)	415 (92.4)	0.40	104 (99.1)	89 (100.0)	1.00	57 (96.6)	64 (100.0)	0.23	192 (97.0)	187 (98.4)	0.50
HPV causes vaginal cancer	179 (38.8)	291 (64.8)	<0.001	77 (73.3)	76 (85.4)	0.04	30 (50.9)	39 (60.9)	0.26	77 (38.9)	116 (61.1)	<0.001
HPV causes vulvar cancer	118 (25.6)	268 (59.7)	<0.001	78 (74.3)	72 (80.9)	0.27	31 (52.5)	36 (56.3)	0.68	74 (37.4)	104 (54.7)	0.001
All correct responses	22 (4.8)	68 (15.1)	<0.001	65 (61.9)	66 (74.2)	0.07	24 (40.7)	33 (51.6)	0.23	36 (18.2)	63 (33.2)	0.001
Smoking increases risk for cervical cancer	382 (82.2)	431 (97.1)	<0.001	92 (87.6)	76 (84.4)	0.52	46 (82.1)	55 (88.7)	0.31	181 (92.4)	179 (95.2)	0.25
Symptoms												
Abnormal vaginal bleeding or discharge *(cervical cancer)*	N/A	N/A	N/A	77 (74.0)	79 (88.8)	0.01	36 (62.1)	46 (71.9)	0.25	145 (73.6)	165 (87.8)	0.001
Abnormal vaginal bleeding or discharge *(vaginal cancer)*	N/A	N/A	N/A	47 (45.2)	60 (67.4)	0.002	27 (46.6)	37 (57.8)	0.21	110 (55.8)	142 (75.5)	<0.001
Abnormal vaginal bleeding or discharge	435 (95.4)	422 (97.0)	0.21	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Changes in bathroom habits	214 (46.9)	365 (83.9)	<0.001	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Itching or burning of the vulva	207 (45.4)	369 (84.8)	<0.001	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Changes in vulva color or skin	241 (52.9)	353 (81.2)	<0.001	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

[a] *p* values from chi square tests or Fisher's exact test

Denominators exclude missing responses. Providers who did not report their specialty or their professional designation are excluded from this analysis.

HPV: human papilloma virus

J Womens Health (Larchmt). Author manuscript; available in PMC 2019 August 01.

N/A: not applicable

Table 4.

Vaccination, testing, and diagnostics for HPV associated cancer

				Providers								
	Public, N=499			Obstetrician-gynecologist, N=106			Primary care, N=64			Other, N=200		
Question	Pre session knowledge n (%)	Post session knowledge n (%)	*P* value[a]	Pre session knowledge n(%)	Post session knowledge n (%)	*P* value[a]	Pre session knowledge n (%)	Post session knowledge n (%)	*P* value[a]	Pre session knowledge n (%)	Post session knowledge n (%)	*P* value[a]
HPV vaccine[b]												
Recommended for 11 and 12 year old girls	234 (49.7)	294 (65.6)	<0.001	47 (47.5)	44 (52.4)	0.51	22 (66.7)	35 (92.1)	0.01	122 (64.6)	159 (87.4)	<0.001
Safe for girls age 9 and older	N/A	N/A	N/A	63 (63.6)	53 (63.1)	0.94	19 (57.6)	32 (84.2)	0.01	100 (52.9)	157 (86.3)	<0.001
Recommended for girls and women ages 13 to 26 who did not get any or all of the shots when they were younger	293 (62.2)	344 (76.8)	<0.001	81 (81.8)	72 (85.7)	0.48	27 (81.8)	34 (89.5)	0.50	122 (64.6)	152 (83.5)	<0.001
Correctly answered HPV vaccine question	72 (15.3)	132 (29.5)	<0.001	24 (24.2)	25 (29.8)	0.40	11 (33.3)	27 (71.1)	0.002	44 (23.3)	111 (61.0)	<0.001
Cervical cancer screening												
Only cervical cancer has an effective screening test	293 (66.9)	335 (77.2)	0.001	78 (74.3)	74 (84.1)	0.10	52 (89.7)	55 (87.3)	0.69	178 (89.5)	162 (86.6)	0.39
It is appropriate to give the Pap test every three years	N/A	N/A	N/A	77 (72.6)	64 (71.9)	0.91	43 (72.9)	58 (90.6)	0.01	125 (63.1)	158 (85.0)	<0.001
The Pap test only screens for cervical cancer	272 (57.5)	323 (72.6)	<0.001	76 (72.4)	65 (75.6)	0.62	47 (81.0)	49 (79.0)	0.78	147 (73.9)	160 (86.0)	0.003
The Pap test does not screen for vaginal cancer	363 (76.7)	383 (86.1)	<0.001	77 (73.3)	66 (76.7)	0.59	50 (86.2)	51 (82.3)	0.55	164 (82.4)	170 (91.4)	0.01
Genetic testing												
Genetic testing is not available for HPV associated cancers	118 (27.6)	146 (35.0)	0.02	82 (78.9)	73 (83.0)	0.47	49 (86.0)	55 (85.9)	0.99	128 (66.3)	134 (71.7)	0.26

[a] *p* values from chi square tests or Fisher's exact test

[b] This analysis excludes 87 surveys due to the Spanish version of the survey having incorrect response options (46 pre-test surveys and 41 post-test surveys).

Denominators exclude missing responses. Providers who did not report their specialty or their professional designation are excluded from this analysis.

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HPV: human papilloma virus

N/A: not applicable

Table 5.

Awareness, behavioral Intentions and level of confidence surrounding gynecologic cancer information

				Providers								
	Public, N=499			Obstetrician-gynecologist, N=106			Primary care, nN=64			Other, N=200		
Question	**Pre-Session Agreement n (%)**	**Post-Session Agreement n (%)**	***P* value[a]**	**Pre-Session Agreement n (%)**	**Post-Session Agreement n (%)**	***P* value[a]**	**Pre-Session Agreement n (%)**	**Post-Session Agreement n (%)**	***P* value[a]**	**Pre-Session Agreement n (%)**	**Post-Session Agreement n (%)**	***P* value[a]**
Confidence with information[b]												
Cervical cancer	N/A	N/A	N/A	98 (97.0)	90 (100.0)	0.10	49 (83.1)	61 (96.8)	0.01	116 (59.2)	172 (93.5)	<0.001
Vaginal cancer	N/A	N/A	N/A	89 (87.3)	87 (96.7)	0.02	32 (55.2)	51 (82.3)	0.001	82 (41.8)	159 (87.4)	<0.001
Vulvar cancer	N/A	N/A	N/A	90 (88.2)	86 (96.6)	0.03	30 (51.7)	52 (83.9)	<0.001	82 (41.8)	153 (85.0)	<0.001
Intentions[c]												
Quit smoking	61 (61.0)	74 (75.5)	0.03	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Get the HPV vaccine[d]	8 (50.0)	17 (100.0)	<0.001	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Get regular Pap tests	363 (88.5)	349 (93.1)	0.03	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

[a] $p < 0.05$ from chi square tests or Fisher's exact test

[b] % Somewhat Confident, Extremely Confident

[c] % Somewhat Likely, Extremely Likely. Women who answered "does not apply" are excluded from the denominator.

[d] Among age-eligible women (24 years and younger based on pre-defined age categories used in the survey). Women who answered "does not apply" are excluded from the denominator.

Denominators exclude missing responses. Providers who did not report their specialty or their professional designation are excluded from this analysis.

HPV: human papilloma virus

N/A: not applicable