Family Physicians' Knowledge of Genital Human Papillomavirus (HPV) Infection and HPV-related Conditions, United States, 2004

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Background and Objectives: *Information about human papillomavirus (HPV) has evolved rapidly and HPV DNA tests are now available. Little is known about family physicians' knowledge about HPV and how it relates to HPV test use and counseling practices.* Methods: *In mid-2004, confidential surveys were mailed to a nationally representative sample of 760 family physicians. We assessed and analyzed relationships between knowledge about HPV, HPV test use, and counseling messages provided when collecting cervical cytology and managing anogenital warts.* Results: *The adjusted response rate was 68% (n=368). Ninety-one percent provided cervical cancer screening, and 90% had managed genital warts. Responses indicated that more than 90% had up-to-date knowledge about several issues: HPV infection is common, persistent infection increases risk of cervical neoplasia, and treatment does not eliminate the causative infection. However, fewer than 50% were aware that HPV infections may clear spontaneously and that the HPV types associated with warts and cervical neoplasia differ. Only 57% had ever used HPV tests. Some HPV knowledge varied by clinician characteristics, and knowledge was associated with HPV test use but not counseling messages.* Conclusions: *Most physicians were aware of new information about HPV infection, but some were unaware of important information relevant for patient counseling. These topics have been highlighted in new clinical training and patient education materials.*

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Over the past decade, new scientific information about genital human papillomavirus (HPV) has increased substantially. This information has included data about the prevalence, natural history, transmissibility, and the association of different types of HPV with different clinical outcomes. It is now known that HPV infection is the most common sexually transmitted infection in the United States. Approximately 20 million persons currently have an HPV infection, and 6.2 million people acquire new infections annually.[1] About 50% of sexually active adults have been infected with genital HPV[2] and among women, up to 80% will be infected by age 50.[3]

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More than 100 different types of HPV have been detected and differentiated as either "high-risk" or "low-risk." Most new genital HPV infections, regardless of type, are benign and transient and regress without medical intervention within 2 years of infection.[5] However, persistent infection with high-risk types (eg, 16, 18) is associated with cervical dysplasia and cervical cancer and is found in more than 99.7% of cervical cancers worldwide.[6] Low-risk types (eg, 6, 11) are primarily associated with anogenital warts.

Recently, new DNA tests for oncogenic HPV genotypes have been approved by the US Food and Drug Administration (FDA) to better stratify women who are infected with HPV to receive colposcopic follow-up of borderline or abnormal Papanicolaou (Pap) tests or to determine persistence of HPV infection in women ages 30 and older as an adjunct to Pap tests. These tests have been recommended by several national organizations, including the American Academy of Family Physicians (AAFP).[7,8]

As primary care specialists, family physicians play a critical role in cervical cancer screening and the prevention, diagnosis, and treatment of anogenital warts and other STDs. Family physicians have an opportunity to counsel and educate patients about genital HPV and how HPV infection relates to cervical cancer and anogenital warts. Until now, there has been limited understanding of the HPV-related knowledge of family physicians in the United States and how this knowledge relates to their practices. We assessed family physicians' knowledge about HPV infection, HPV tests use, and counseling messages provided to patients when collecting cervical cytology and managing anogenital warts.

Methods

Sample

We surveyed nationally representative samples of family physicians. These family physicians were identified from the American Medical Association (AMA) Physician Masterfile, the most comprehensive US physician database that includes both AMA members and nonmembers. The sample was restricted to office-based family physicians whose Masterfile records indicated that they spent the majority of their time in direct patient care.

Survey Instrument

Final survey content and format were developed and validated based on input of experts in HPV, cervical cancer, clinician survey psychometrics, and >150 practicing clinicians, including pilot testing with several family physicians. The survey addressed (1) clinicians' demographic characteristics, (2) characteristics of their practice and patients, (3) experience with cervical cancer screening and diagnosis of anogenital warts and other sexually transmitted diseases [STDs], (4) awareness and use of HPV tests, and (5) knowledge about genital HPV infection and HPV-related conditions. We assessed knowledge by asking respondents to indicate their agreement with 11 true or false statements about HPV infection and HPV-related conditions. To discourage respondents from researching their answers, we noted that HPV information is rapidly evolving and asked them to respond based on information they had seen. The survey also asked about the frequency of using various counseling messages when screening for cervical cancer among immunocompetent patients with no past history of abnormal cytology results and low-to-average cervical cancer risk and also about counseling messages when managing patients with anogenital warts. Counseling frequency was measured by 5-point Likert scales ranging from "never" to "always."

Data Collection

All data collection procedures were approved by human subjects protection procedures at the Centers for Disease Control and Prevention (CDC) and Battelle Memorial Institute and by the federal Office of Management and Budget. Confidential self-administered surveys were express mailed in May 2004 with a cover letter from the CDC explaining that findings would be used to update clinical training curricula, decision support tools, and materials for patient education and counseling. A $50 cash incentive, a postage-paid return envelope, and a reply postcard were also enclosed. The reply postcard was for clinicians or their office managers to indicate ineligibility due to death, retirement, or relocation.

Repeat mailings were sent to nonrespondents approximately 3, 6, 9, and 15 weeks after the initial mailing. All surveys returned by September 30, 2004, were analyzed. All identifying information used in mailings was unlinked from identification numbers used for data entry and analysis.

Data Analysis

Analysis was restricted to family physicians who reported that they practiced >8 hours per week in an outpatient setting, provided routine checkups, and that more than 20% of their patients were ages 13–65 years. After data were double-entered and cleaned, case weights were assigned to adjust for nonresponse bias. The weight for nonresponse bias was calculated by using clinician characteristics that were available in the AMA Masterfile for nonrespondents and respondents.

We examined relationships between up-to-date HPV knowledge and clinician, patient, and practice demographics, HPV testing practices, and counseling messages when collecting Pap tests or managing patients with anogenital warts. In these bivariate analyses, knowledge was coded dichotomously (correct versus incorrect or unsure) and counseling messages were also classified dichotomously ("never/sometimes/half the time" versus "usually/always"). Chi-square, *t* tests, odds ratios, and 95% confidence intervals were calculated using standard methods (SAS software version 9.1, STATA, and SUDAAN).

Results

Of the 760 surveys sent to family physicians, 97 were undeliverable. Nine physicians were deceased, 173 did not respond or refused to participate, and 113 were ineligible, leaving 368 surveys available for analysis. The adjusted response rate was thus 68%.

Demographic, Practice, and Patient Characteristics

The mean age of respondents was 47.6 years and most (70%) were male. Fifty-five percent had practiced ≥ 15 years (Table 1). Approximately three quarters were in private practice and group practice settings. Most respondents reported that the majority of their patients were female, and nearly half of them were ages 13–50 years.

Table 1

Characteristics of Family Physician Respondents, Their Primary Outpatient Practice, and Their Patients (n=368)

Characteristic	*Value (%) or Mean (95% CI)**
Age (%)	
< 45 years	43 (37–48)
≥ 45 years	57 (52–63)
Gender (%)	
Female	30 (25–35)
Male	70 (65–75)
Years in clinical practice (%)	
< 15 years	45 (40–50)
≥ 15 years	55 (50–60)
Number of patients seen per week (%)	
< 100	39 (34–44)
≥ 100	61 (56–66)
Setting of practice (%)	
Private setting	76 (72–80)
Other	24 (20–28)
Type of practice (%)	
Solo	29 (24–33)
Group (single or multi-specialty)	71 (67–76)
% of patient population that is female	
< 50%	11 (7–14)
≥ 50%	89 (86–93)
Median number of patients seen in last 12 months with:	
Chlamydia	5
Herpes simplex	5
Genital warts	2
% offering Pap tests	91 (88–94)
Median number of Pap tests collected in past 12 months**	150
Median number of patients with abnormal Pap test results in past 12 months**	10
Ever use HPV DNA test for any reason (%):	
Yes	57 (52–62)
No	33 (28–38)
Unaware of test	10 (7–13)

* 95% confidence interval
** Among 333 family physicians who reported providing Pap tests in their primary practice site
CI—confidence interval
HPV—human papillomavirus

Experience With Cervical Cancer Screening, Abnormal Cytology Management, Anogenital Warts, and STDs

Most physicians (91%) offered cervical cancer screening. Over the last 12 months, these physicians reported a median of 150 Pap tests collected and a median of 10 patients with abnormal or borderline Pap test results. More female physicians than male physicians (86 versus 58%) collected >100 Pap tests in the past 12 months. Most physicians (90%) reported having ever managed patients with anogenital warts. However, on average, most family physicians had seen few patient cases of anogenital warts (median two cases) in the past year. They also saw few cases of chlamydia (median five cases) or herpes simplex virus (HSV) (median five cases) in the past year (Table 1).

HPV Test Awareness and Use

While 10% of family physicians were unaware of HPV DNA tests, 57% reported having ever used HPV DNA tests for any reason (Table 1). Of those who performed cervical cancer screening, 51% reported having ordered or collected HPV DNA tests for women with abnormal Pap test results, and 19% reported having collected HPV tests as an adjunct to Pap tests for cervical cancer screening.

Knowledge About Genital HPV Infection and HPV-related Conditions

Eighty-nine percent of family physicians correctly agreed that genital HPV infection is common in sexually active adults. More than 90% correctly agreed that infected persons may be asymptomatic, that persistent genital HPV infection in women increases the risk of cervical dysplasia and cancer, and that treatment of anogenital warts and cervical dysplasia does not permanently eliminate the infection—all of these responses are consistent with current scientific evidence (Table 2).

However, fewer than half of clinicians agreed that HPV types associated with anogenital warts differ from those associated with cervical dysplasia and cervical cancer (47%), that anogenital warts do not increase cancer risk at the same anatomic site (38%), and that most HPV infections may clear without medical intervention (33%), even though these statements are also consistent with current scientific evidence. Although knowledge of specific issues varied by some physician demographic and practice characteristics, there were no consistent patterns (Table 3).

Relationship of HPV-related Knowledge and HPV Test Use

Family physicians who used HPV DNA tests for any reason had significantly more up-to-date knowledge on some HPV-related topics compared to physicians who did not use HPV tests (Table 4). However, many who used HPV DNA tests were not aware of some information that might be relevant to counseling patients: HPV infections may clear without medical intervention, HPV types associated with warts and with cervical dysplasia and cancer are different, and genital warts do not increase cancer risk at the site where warts are located.

Table 2

Knowledge About Genital HPV Infection and HPV-related Conditions (n=368)

Statement	*% Correct (95% CI)**	*% Incorrect (95% CI)**	*% Not Sure (95% CI)**
Genital HPV infection is fairly common in sexually active adults.	89 (86–92)	7 (4–10)	4 (2–6)
A person with genital HPV infection may never show symptoms or signs of infection.	95 (93–97)	3 (1–5)	2 (0–3)
Most genital HPV infections may be cleared without medical intervention.	33 (28–38)	55 (50–61)	12 (8–15)
Persistent genital HPV infection in women increases risk of cervical dysplasia and cervical cancer.	98 (97–99)	1 (0–2)	1 (0–2)
Genital HPV infection in men increases risk of penile and other anogenital cancers.	64 (59–69)	14 (10–18)	22 (18–27)
Treatment of cervical dysplasia/cancer does not always permanently eliminate the causative infection.**	91 (88–94)	3 (1–5)	6 (3–8)
Genital HPV infection causes external anogenital warts.	89 (85–92)	8 (5–11)	3 (2–5)
Genital HPV types usually associated with external anogenital warts differ from types usually associated with cervical dysplasia and cervical cancer.	47 (41–52)	28 (24–33)	25 (21–30)
External anogenital warts do not increase the risk of cancer at the same site where the warts are located.**	38 (33–43)	37 (32–42)	25 (21–30)
Treatment of external anogenital warts does not always permanently eliminate the causative infection.**	92 (90–95)	2 (0–3)	5 (3–8)
Available tests and procedures cannot determine the duration of a patient's genital HPV infection.**	73 (68–77)	6 (3–8)	21 (17–26)

HPV—human papillomavirus
CI—confidence interval

* 95% confidence interval
** These statements were phrased as false statements in the questionnaire but have been reworded here as true statements for consistent data presentation.

Relationship of HPV-Related Knowledge and Counseling Messages When Screening for Cervical Cancer

Many of the 333 clinicians who provided Pap tests indicated that when they collected Pap tests they usually or always discussed behaviors to assess STD risk (69%) and discussed methods to prevent STDs (67%). Fewer reported that they usually/always counseled patients about cervical cancer; either addressing methods to prevent cervical cancer (46%), discussing genital HPV as a risk factor for cervical cancer (41%), or discussing ways to prevent acquiring HPV infection (41%). Reported HPV-related knowledge was not significantly associated with the provision of any of these STD, HPV, or cervical cancer prevention messages when collecting Pap tests.

Relationship of HPV-related Knowledge and Counseling Messages When Managing Patients with Anogenital Warts

Of 331 family physicians who reported ever managing patients with genital warts, most reported that they usually/always discussed with patients ways to prevent HPV transmission to sex partners (86%), that a virus or HPV causes warts (97%), and that warts are sexually transmitted (96%). Slightly fewer explained that the duration of HPV infection is unknown (75%). Many physicians counseled that genital warts increased risk for anogenital cancers (77%), a statement not consistent with current evidence. Reported HPV-related knowledge was not significantly associated with the provision of any of these counseling messages.

Discussion

This is the first nationally representative survey of family physicians in the United States to assess knowledge of genital HPV infection and HPV-related conditions. The high response rate and adjustment for nonresponse provides confidence that the sample is generally representative of practicing family physicians in the United States. Survey development, piloting, and use of methods to discourage respondents to research knowledge information have also enhanced response validity. However, like all surveys, reported knowledge and practices may not reflect actual knowledge and practices.

Table 3

Percentage of Family Physicians Giving Correct Responses to Selected Knowledge Statements, by Selected Characteristics

	Most genital HPV infections may be cleared without medical intervention.	*Genital HPV types usually associated with external anogenital warts differ from types usually associated with cervical dysplasia and cervical cancer.*	*External anogenital warts do not increase risk of cancer at same site where warts are located.**
	% (OR) [95% CI]	*% (OR) [95% CI]*	*% (OR) [95% CI]*
Characteristic			
Gender (%)			
Male	29 (1.0)	40 (1.0)	37 (1.0)
Female	43 (1.9) [1.1–3.0]**	61 (2.4) [1.5–3.8]**	42 (1.3) [0.8–2.0]
Years in clinical practice (%)			
< 15 years	38 (1.0)	55 (1.0)	39 (1.0)
≥ 15 years	29 (0.7) [0.4–1.0]**	40 (0.6) [0.4–0.8]**	38 (1.0) [0.6–1.5]
Setting of practice (%)			
Private setting	30 (1.0)	45 (1.0)	38 (1.0)
Other	44 (1.8) [1.1–3.0]**	53 (1.4) [0.9-2.3]	38 (1.0) [0.6-1.6]
Type of practice (%)			
Solo	23 (1.0)	37 (1.0)	37 (1.0)
Group (single or multi-specialty)	37 (1.9) [1.1–3.3]**	51 (1.8) [1.1–2.9]**	38 (1.0) [0.7-1.7]

* These statements were phrased as false statements in the questionnaire but have been reworded here as true statements for consistent data presentation
** $P<.05$

OR—odds ratio
CI—confidence interval
HPV—human papillomavirus

Most physicians were aware of new scientific evidence about HPV infection and HPV-related conditions, but many were unaware of important details that could influence counseling messages and clinical management. These include the usually transient and benign nature of genital HPV infections and differences in HPV genotypes associated with anogenital warts and cervical cancer. Our findings are consistent with other studies of HPV-related knowledge that show clinicians do not understand the relationship of genital warts to anogenital cancers.[9,10]

Knowledge on some, but not all, topics was significantly more up to date among physicians who were female, in practice <15 years, and practiced in group practices or nonprivate settings. These differences may be related to physician experience with cervical cancer screening, in that male physicians in our survey provided less screening than female physicians. This suggests that interventions for increasing physician knowledge about HPV infection should be targeted to particular physician subgroups, such as male physicians, those in practice ≥15 years, and those in private and/or solo practices. Consequently, the CDC has used survey findings to update clinical training and decision support tools for clinicians. This information complements other materials that have been developed by the AAFP and other national clinical organizations.[11-17]

In this survey, more than half of respondents had used HPV DNA tests for some reason, most commonly to manage patients with borderline or abnormal Pap test results as approved by the FDA and recommended by guidelines. Knowledge about genital HPV infection was slightly higher among physicians who reported they had used HPV tests compared to physicians who had not used tests. This suggests that test use has been either accompanied by increased clinician understanding of HPV infection or that clinicians with better knowledge of HPV are early adopters of HPV test use. However,

regardless of test use, knowledge about the transient, benign nature of HPV infection and the differences in clinical sequelae of various HPV subtypes was low among most clinicians surveyed. Low knowledge of these important aspects may lead to either inappropriate uses of HPV tests among patients as well as underuse or overuse of tests. Additionally, education of patients, especially young patients, that most HPV infections are benign and transient may reduce inappropriate patient demand for HPV testing and help prevent anxiety or stigma among patients with positive HPV tests. To enhance this understanding for patients and physicians, several recent clinical education materials, counseling guides, and patient education materials have been developed.[11,13,18]

HPV knowledge was not related to the frequency of various counseling messages being provided when collecting Pap tests or when managing patients with genital warts. As HPV knowledge was generally high among respondents, providing counseling messages may be related to other factors, such as time, available staff, clinician comfort discussing STDs, and competing clinical priorities.[19] Studies show that patients with warts desire information on transmissibility and treatment of the infection, advice on whether to inform sex partners of their infection, and explanations of the risks of development of cancer.[20,21] Most clinicians appropriately addressed STD-related issues with patients who have sexually transmitted genital warts; however, some also reported they told patients that genital warts increase the risk for anogenital cancers, a statement not supported by current evidence.[22,23] Studies also show that women undergoing cervical cancer screening may desire information about transmission of HPV infection to partners, prevention of HPV infection, treatment issues around HPV infection, and the risk of cervical cancer development.[24,25]

When collecting Pap tests on low- to average-risk patients, some physicians reported that they discussed STD issues, but only a minority discussed HPV infection specifically. This may be because clinicians do not understand details about HPV infection themselves

Table 4

Correct Responses About Genital HPV Infection and HPV-related Conditions, by Ever Used HPV DNA Tests for Any Reason at Primary Practice Site

	Never Used HPV DNA Test (n=160) % Correct	*Ever Used HPV DNA Test (n=208) % Correct*	*Odds Ratio (95% CI)*
Genital HPV infection is fairly common in sexually active adults.	86	91	1.6 (0.8,3.2)
A person with genital HPV infection may never show symptoms or signs of infection.	92	98	3.7 (1.3, 10.9)**
Most genital HPV infections may be cleared without medical intervention.	22	41	2.5 (1.5, 3.9)**
Persistent genital HPV infection in women increases risk of cervical dysplasia and cervical cancer.	97	99	1.7 (0.4, 7.5)
Genital HPV infection in men increases risk of penile and other anogenital cancers.	61	66	1.2 (0.8, 1.9)
Treatment of cervical dysplasia/cancer does not always permanently eliminate the causative infection.*	88	94	2.0 (0.9, 4.2)
Genital HPV infection causes external anogenital warts.	85	91	1.8 (0.9, 3.4)
Genital HPV types usually associated with external anogenital warts differ from types usually associated with cervical dysplasia and cervical cancer.	42	50	1.4 (0.9, 2.1)
External anogenital warts do not increase the risk of cancer at the same site where the warts are located.*	36	39	1.1 (0.7, 1.7)
Treatment of external anogenital warts does not always permanently eliminate the causative infection.*	89	95	2.4 (1.1, 5.5)**
Available tests and procedures cannot determine the duration of a patient's genital HPV infection.*	67	77	1.7 (1.1, 2.7)**

* These statements were phrased as false statements in the questionnaire but have been reworded here as true statements for consistent data presentation
** $P<.05$
HPV—human papillomavirus
CI—confidence interval

or feel that providing information about HPV is not necessary, may confuse patients, cause anxiety, and be time-consuming to explain.[20,26] Studies show that physicians' lack of knowledge about HPV may lower patient satisfaction with counseling.[27] To assist family physicians in providing accurate and detailed information to patients with anogenital warts or when collecting Pap tests, several organizations have developed counseling scripts and patient education materials.[11,13,14,18]

Conclusions

In this nationally representative survey, the HPV-related knowledge of family physicians was generally consistent with current scientific evidence. However, knowledge of some recent issues, such as the transient nature of HPV infections, the different types of HPV, and the different outcomes of HPV infection such as benign (warts) and malignant (cervical cancer and anogenital cancers) were less well understood. Fortunately, many organizations have recently developed materials to help improve clinicians' knowledge of clinically relevant issues around HPV, including training curricula, fact sheets, HPV test algorithms, counseling guides, and patient education. Applying this new information in practice will hopefully translate into more accurate and relevant counseling messages when family physicians perform cervical cancer screening or manage patients with anogenital warts.

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