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A National Survey of Canadian Physicians on HPV: Knowledge, Barriers, and Preventive Practices



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Abstract

Objective: Physicians are the sole prescribers of the HPV vaccine for adults in Canada. This survey of Canadian physicians aimed to explore knowledge, barriers, and preventive practices regarding HPV vaccination.

Method: A survey of general practitioners (GPs) (n = 337) and obstetrician/gynaecologists (OB/GYNs) (n = 81) was conducted in May and June 2016 using an online panel. Demographic data and information pertaining to HPV knowledge, attitudes, and vaccination practices were collected by using a 22-item questionnaire.

Results: A total of 83% of GPs recommended or administered HPV vaccine to adults. Among physicians, 99% to 100% strongly agreed that vaccination is an important aspect of disease prevention. Physicians were rarely concerned about vaccine safety (5%–11%). Cost was seen as the number one barrier by 92% to 95% of physicians. Physicians rated consumers' understanding of HPV to be low (11%–14%, very good; and 49%–56%, somewhat good knowledge). Among physicians, 60% to 66% of said they routinely discussed HPV vaccination with patients. Female physicians demonstrated greater knowledge of HPV than their male counterparts.

Conclusion: GPs and obstetrician/gynaecologists routinely recommend and administer the HPV vaccine to patients. The majority of physicians showed high levels of knowledge regarding HPV vaccine and associated cancers; however, perceived barriers of cost may limit recommendations for vaccination, particularly among older women or men.

Key Words: Human papillomavirus, HPV vaccination, HPV knowledge, national survey, Canadian GPs, Canadian OB/GYNs

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Résumé

Objectif : Au Canada, seuls les médecins peuvent prescrire le vaccin anti-VPH pour les adultes. Ce sondage effectué auprès de médecins canadiens visait à explorer les connaissances, les obstacles et les pratiques préventives en matière de vaccination contre le VPH.

Méthodologie : Un sondage par panel Web a été mené auprès d'omnipraticiens (n = 337) et d'obstétriciens-gynécologues (n = 81) en mai et juin 2016. Un questionnaire comportant 22 items a servi à recueillir des données démographiques ainsi que de l'information sur leurs connaissances sur le VPH, leurs attitudes face au VPH et leurs pratiques vaccinales.

Résultats : Au total, 83% des omnipraticiens avaient recommandé ou administré le vaccin anti-VPH à des adultes. Entre 99 et 100% des médecins étaient fortement d'accord pour dire que la vaccination est un aspect important de la prévention de la maladie. Les répondants étaient rarement inquiets quant à l'innocuité des vaccins (5% à 11%) et ils considéraient que le principal obstacle à la vaccination était son coût (92% à 95%). Par ailleurs, les médecins jugeaient que les connaissances des consommateurs sur le VPH étaient faibles (11% à 14% : connaissances très bonnes; 49% à 56% : connaissances plus ou moins bonnes). Parmi les médecins, 60 à 66% ont mentionné qu'ils parlaient régulièrement de la vaccination contre le VPH avec leurs patients. Les femmes médecins avaient une plus grande connaissance du VPH que leurs collègues masculins.

Conclusions : Les omnipraticiens et les obstétriciens-gynécologues recommandent et administrent régulièrement le vaccin anti-VPH à leurs patients. La majorité des médecins démontraient un niveau élevé de connaissances sur le vaccin et sur les cancers associés au virus. Toutefois, les obstacles perçus quant au coût du vaccin pourraient limiter sa recommandation, surtout auprès des femmes et des hommes plus âgés.

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INTRODUCTION

HPV infection is the most common sexually transmitted disease worldwide and is associated with several types of cancers, including cervical, vaginal, vulvar, anal, penile, and oral-pharyngeal cancers, as well as anogenital warts.^{1,2} Approximately 75% of individuals will be infected with HPV at least once during their lifetime,³ with estimated HPV prevalence among women at 11.4%⁴ and wide ranges in estimated HPV prevalence among men, from 2% to 98%.⁵ In Canada, the annual burden of HPV is substantial, amounting to approximately 613 deaths from cervical, vulvar, and vaginal cancers⁶; 1994 incident cases of cervical, vulvar, and vaginal cancers⁷; 77 000 incident cases of anogenital warts, vulvar intraepithelial neoplasia (VIN), and vaginal intraepithelial neoplasia (VAIN); and over 4 million cervical cancer screenings performed, 325 000 of which resulted in abnormal results and further investigations.⁸

The HPV vaccine has made primary prevention of HPV infection possible. Robust clinical trials have proven the efficacy of the bivalent HPV-16/18 vaccine (Cervarix, GlaxoSmithKline, Rixensart, Belgium) in reducing risk of cervical dysplasia^{9,10} and the quadrivalent HPV-6/11/16/18 vaccine (Gardasil, Merck, Whitehouse Station, NJ) in reducing risk of cervical, vaginal, vulvar, and anal dysplasia, as well as anogenital warts.^{11–13} The most recent HPV vaccine (Gardasil 9) provides additional protection against HPV types 31, 33, 45, 52, and 58.^{14,15} Since the first licensing of the HPV vaccine in 2006, over 270 million doses have been distributed internationally, and extensive safety reviews have been conducted using data collected by clinical trials and epidemiologic observational surveillance.¹⁶

In Canada, publicly funded school-based HPV vaccination programs for adolescent girls were implemented in all provinces and territories from 2007–2010; vaccine uptake rates in these programs range from 47% in the Northwest Territories to 93% in Newfoundland and Labrador.^{8,17} By 2017, all provinces and territories had included boys in the school-based

ABBREVIATIONS

GP	general practitioner
NACI	National Advisory Committee on Immunization
OB/GYN	obstetrician/gynaecologist

Box. NACI guidelines - July 2016^a

- 2vHPV, 4vHPV, or 9vHPV vaccine is recommended for girls and women age 9 to 26 and may be used in women *over age 26* (no upper age limit) who have not been vaccinated previously or who have not completed the series
- *Is* recommended for those with current or past history of Pap abnormalities, cervical cancer, and anogenital warts

^a4vHPV or 9vHPV vaccine recommended for boys and men age 9 to 26 and may be used in men *over age 26* (no upper age limit) who have not been vaccinated previously or who have not completed the series.

Adapted from National Advisory Committee on Immunization, editor. Updated recommendations on human papillomavirus (HPV) vaccines: 9-valent HPV vaccine and clarification of minimum intervals between doses in the HPV immunization schedule. Ottawa: Public Health Agency of Canada; 2017.

programs.¹⁸ Beyond the publicly funded, school-based HPV vaccine programs, individuals may access the HPV vaccine opportunistically from a physician by paying out of pocket.

The most recent survey of Canadian clinicians' knowledge, attitudes, and beliefs regarding vaccination against HPV was conducted in 2006; however, most data regarding willingness to prescribe were related to adolescent girls only.¹⁹ Since then, vaccination of adolescent girls has moved out of the doctor's office and into schools, so current engagement of Canadian physicians in HPV vaccination should be focused on those missed by school-based vaccination. In July 2016, the National Advisory Committee on Immunization released updated guidelines for HPV vaccination that extended recommendations to include women and men over age 26 (Box).²⁰ Gaps in the literature exist regarding current HPV knowledge and vaccination practices among Canadian physicians, particularly regarding vaccinating adult men and women. Our main research objective was therefore to explore knowledge, barriers, and clinical practices surrounding HPV prevention among general practitioners and obstetricians/gynaecologists in Canada.

METHODS

Sampling

A cross-sectional online survey of GPs and OB/GYNs was conducted, on the researchers' behalf, by Leger Canada (Montréal, QC, Canada) from May to June 2016. The sampling frame included GPs and OB/GYNs across all provinces and territories of Canada. GPs were included in the study only if they reported prescribing the HPV vaccine in their practice. Quota sampling was used with the aim of surveying a total of 400 physicians across Canada: 300 GPs and 100 OB/GYNs. A probability sample of the same size would yield a margin of error of $\pm 4.8\%$, 19 times

out of 20. The list of individuals to be recruited to the survey was accessed through the SmartPoint Research physician panel, which includes approximately 50 000 Canadian doctors recruited through advertising in journals, publications, and social media and colleague referrals. Individuals were invited to participate in the survey by email and were offered a nominal financial incentive. All participants gave informed consent for the use of their data for research purposes.

Survey

A questionnaire was developed to assess physicians' practices, knowledge, and beliefs related to HPV and the HPV vaccine. The questionnaires were developed by Leger with support from the SOGC and HPV experts. The validity of the questionnaire was assessed, and pilot testing was performed. The results of the pilot test were checked for clarity and skip logic before a full launch. The questionnaire consisted of 22 questions and included a mix of yes/no, Likert scale, and open-ended questions. A copy of the questionnaire is in the online [Appendix](#).

Statistical Analysis

The findings were summarized using descriptive statistics, and we performed tests of difference between respondent groups using *t* tests for means and χ^2 tests for percentages (tested at $\alpha = 0.05$ and $\alpha = 0.01$). Results were stratified by provider type and by provider sex. All analyses were performed using SPSS software (IBM Corp., Armonk, NY) and WinCross software (Informer Technologies, Inc., Los Angeles, CA).

RESULTS

A total of 378 GPs and 101 OB/GYNs completed the survey. The response rate was 8% for GPs and 12% for OB/GYNs. Demographic characteristics of the respondents are shown in [Table 1](#). The majority of GPs (66%) and OB/GYNs (74%) were male. Respondents reported a mean of 22.1 years of full-time clinical practice. The GPs and OB/GYNs resided in provinces and territories across Canada, with the majority from Ontario (44%), Québec (23%), and British Columbia (14%).

Clinical Practices Related to the HPV Vaccine

As shown in [Table 2](#), GPs and OB/GYNs frequently recommend HPV vaccination in their practices. A total of 83% of GPs reported routinely administering or recommending the HPV vaccine to adults in their practice, and a greater proportion of female GPs administered the HPV vaccine relative to male GPs (91% vs. 79%). Both GPs

and OB/GYNs discuss HPV and HPV vaccination frequently, on average 25.3 and 29.8 times per month, respectively. Female physicians reported more discussions with patients, on average 35.5 times per month, as compared with 22.4 times per month among male physicians ([Table 3](#)). GPs prescribe or recommend the HPV vaccine more frequently than OB/GYNs; overall, GPs reported prescribing or recommending the vaccine 31.7 times per month, as compared with 23.4 times per month for OB/GYNs. Rates of HPV vaccine prescriptions or recommendations were significantly higher among female physicians as compared with male physicians (48 vs. 22.1 prescriptions/recommendations per months). GPs prescribe and recommend HPV vaccines most frequently to young female patients, whereas OB/GYNs prescribe and recommend HPV vaccines more often to older female patients; this finding is likely reflective of their patient populations.

OB/GYNs most often perceived that their role with respect to educating patients about HPV is to counsel, advise, and provide information or recommendations about HPV (65%); to discuss HPV with patients undergoing colposcopy (18%); to discuss methods of prevention (13%); or to discuss transmission or treatment of HPV (11%).

HPV Vaccine Knowledge

Nearly all physicians agreed that vaccination is an important aspect of disease prevention. The majority of physicians recognized the benefits of the HPV vaccine across a number of different patient types ([Table 2](#)). OB/GYNs were significantly more likely to agree that Pap tests are an effective way of preventing cervical cancer. A greater proportion of OB/GYNs than GPs see the benefit of vaccinating individuals who have already been exposed to the virus (including women over age 18). The majority of physicians believe in all the prevention benefits associated with the HPV vaccine; however, fewer counsel patients about all the benefits.

Several gaps in physicians' knowledge of HPV were identified by the survey. Examples of incorrect assumptions are as follows: 35% of physicians (37% of GPs and 26% of OB/GYNs) believed that HPV could be prevented by the use of condoms; 13% did not view HPV as a serious health risk; 9% believed that the only symptoms of HPV are genital warts; 15% believed that patients do not need the HPV vaccine until they become sexually active; and 11% believed there is no point in receiving the HPV vaccine once patients have already been exposed to the virus. Finally, a small but considerable proportion of physicians incorrectly believed that the HPV vaccine does not work (5%) or expressed concerns about vaccine safety (10%).

Table 1. Demographic and medical-practice profiles of GPs and OB/GYNs

	GPs n (%)	OB/GYN n (%)	Total n (%)
Sex			
Male	221 (65.4)	69 (68.3)	290 (66.1)
Female	112 (33.1)	32 (31.7)	144 (32.8)
Unknown	5 (1.4)	—	5 (1.1)
Years in full time clinical practice			
2–10	46 (13.6)	11 (10.9)	57 (13.0)
11–19	81 (24.0)	29 (28.7)	110 (25.1)
20–29	120 (35.5)	34 (33.7)	154 (35.0)
30+	91 (26.9)	25 (26.7)	118 (26.9)
Mean	22.0	22.1	22.1
Location of residence			
British Columbia	44 (13)	17 (16.8)	61 (13.9)
Alberta	33 (9.8)	9 (8.9)	42 (9.6)
Saskatchewan	6 (1.8)	0 (0)	6 (1.4)
Manitoba	9 (2.7)	2 (2.0)	11 (2.5)
Ontario	149 (44.1)	46 (45.5)	195 (44.3)
Québec	79 (23.4)	21 (20.8)	100 (22.8)
New Brunswick	5 (1.5)	2 (2.0)	7 (1.6)
Nova Scotia	7 (2.1)	3 (3.0)	10 (2.3)
Newfoundland	6 (1.8)	0 (0)	6 (1.4)
Northwest Territories	0 (0)	1 (1)	1 (0.2)
Vaccinations routinely administered or recommended to adults (GPs only)			
Flu	335 (99.1)	—	335 (99.1)
Hepatitis B	326 (96.4)	—	326 (96.4)
Hepatitis A	321 (95.0)	—	321 (95.0)
Td/Tdap	319 (94.4)	—	319 (94.4)
Pneumococcal	318 (94.1)	—	318 (94.1)
Chickenpox/varicella	229 (67.8)	—	229 (67.8)
Measles, mumps, rubella	225 (66.6)	—	225 (66.6)
Meningococcal disease	205 (60.7)	—	205 (60.7)
Rabies	70 (20.7)	—	70 (20.7)
Yellow fever	41 (12.1)	—	41 (12.1)
Zostavax	20 (5.9)	—	20 (5.9)
Typhoid	13 (3.8)	—	13 (3.8)
Total	338	101	439 (100)

Note: no respondents from Prince Edward Island, Nunavut, or Yukon were included in this sample.

Information-Seeking Behaviours for HPV Information

As shown in Table 4, OB/GYNs were more likely than GPs to have found pamphlets, brochures, handouts, and access to health authorities (e.g., the SOGC) helpful when consulting with patients about HPV and HPV vaccinations. When seeking information on HPV and HPV vaccination,

most physicians preferred that the resource originate in Canada. OB/GYNs were more familiar than GPs with the recommendations regarding HPV vaccination. The majority of GPs and OB/GYNs considered the health guidelines influential to their practice. For physicians residing outside Québec, influential guidelines were those offered by the

Table 2. HPV-related attitudes, knowledge, and practices among health care professionals

Item, n (%)	GPs (n = 338)	OB-GYNs (n = 101)	Total (N = 439)
How many times do you discuss HPV and the HPV vaccine with your patients in a typical month?	25.3	32.1	26.8
How many times do you prescribe or recommend HPV vaccine in a typical month? (overall)	31.9	26.2	30.6
Girls (9–17 years)	7.3	3.7 ^a	6.4
Women (18–26 years)	8.9	11.3	9.5
Women (27–45 years)	6.1 ^a	10.4	7.1
Boys (9–17 years)	3.7	0.2 ^a	2.9
Men (18–26 years)	3.7	0.3 ^a	2.9
Men (27–45 years)	2.3	0.2	1.8
In your opinion, which of the following benefits (in terms of prevention) do you associate with the HPV vaccine?			
Genital warts	323 (95.6)	98 (97.0)	421 (98.6)
Cervical cancer	334 (98.8)	99 (98.0)	433 (98.6)
Vulvar cancer	245 (72.5)	85 (84.2)	330 (75.2)
Cervical pre-cancer	297 (87.9)	97 (96.0)	394 (89.7)
Vaginal cancers	211 (62.4)	74 (73.3)	285 (64.9)
Anal cancer	261 (77.2)	82 (81.2)	343 (78.1)
Spread of HPV to sexual partners	300 (88.8)	85 (84.2)	385 (87.7)
Which potential consequences/benefits do you counsel your patients about with respect to vaccination?			
Genital warts	276 (81.7)	93 (92.1)	369 (84.1)
Cervical cancer	294 (87)	89 (88.1)	383 (87.2)
Vulvar cancer	145 (42.9)	58 (57.4)	203 (46.2)
Cervical pre-cancer	216 (63.9)	84 (83.2)	300 (68.2)
Vaginal cancers	118 (34.9)	45 (44.6)	163 (37.1)
Anal cancer	178 (52.7)	51 (50.5)	229 (52.2)
Spread of HPV to sexual partners	229 (67.8)	63 (62.4)	292 (66.5)
How beneficial do you believe the HPV vaccine is across the following patient types?			
Patients with a history of genital warts			
Greatly beneficial or somewhat beneficial	314 (92.9) ^a	99 (98.0)	413 (94.1)
Not very beneficial or not at all beneficial	24 (7.1)	2 (2.0) ^a	26 (5.9)
Female patients with a history of abnormal Pap results			
Greatly beneficial or somewhat beneficial	323 (95.6)	97 (96)	420 (95.7)
Not very beneficial or not at all beneficial	15 (4.4)	4 (4.0)	19 (4.3)
Female patients being referred for a colposcopy			
Greatly beneficial or somewhat beneficial	318 (94.1)	97 (96.0)	415 (94.5)
Not very beneficial or not at all beneficial	20 (5.9)	4 (4.0)	24 (5.5)
Female patients with a history of HPV related cancer (cervical, vaginal, vulvar cancer)			
Greatly beneficial or somewhat beneficial	300 (88.8)	70 (69.3) ^a	370 (84.3)
Not very beneficial or not at all beneficial	38 (11.2) ^a	31 (30.7%)	69 (15.7)
Patients with a history of anal cancer			
Greatly beneficial or somewhat beneficial	299 (88.5)	84 (83.2)	383 (87.2)
Not very beneficial or not at all beneficial	39 (11.5)	17 (16.8)	56 (12.8)

(continued)

Table 2 (Continued)

Item, n (%)	GPs (n = 338)	OB-GYNs (n = 101)	Total (N = 439)
Knowledge of HPV and the prevention of HPV associated cancers			
I believe that vaccination is an important aspect of disease prevention			
Strongly agree or somewhat agree	334 (98.8)	101 (100)	435 (99.1)
Somewhat disagree or strongly disagree	4 (1.2)	0	4 (0.9)
Pap tests are an effective way of preventing cervical cancer			
Strongly agree or somewhat agree	281 (83.1)	91 (90.1)	372 (84.7)
Somewhat disagree or strongly disagree	57 (16.9)	10 (9.9)	67 (15.3)
Having a Pap every 3 years is sufficient			
Strongly agree or somewhat agree	235 (69.5)	73 (72.3)	308 (70.2)
Somewhat disagree or strongly disagree	103 (30.5)	28 (27.7)	131 (29.8)
Patients do not need to get vaccinated against HPV if they regularly get a Pap test			
Strongly agree or somewhat agree	32 (9.5)	4 (4.0)	36 (8.2)
Somewhat disagree or strongly disagree	306 (90.5)	97 (96.0)	403 (91.8)
I believe that the only symptom of HPV is genital warts			
Strongly agree or somewhat agree	34 (10.1)	4 (4.0) ^a	38 (8.7)
Somewhat disagree or strongly disagree	304 (89.9) ^a	97 (96.0)	401 (91.3)
I believe that the HPV vaccine is only for teenage girls and not for women aged 18 and older			
Strongly agree or somewhat agree	26 (7.7)	2 (2.0) ^a	28 (6.4)
Somewhat disagree or strongly disagree	312 (92.3) ^a	99 (98.0)	411 (93.6)
In general, I believe that there is no point in receiving the HPV vaccine once patients have already been exposed to the HPV virus			
Strongly agree or somewhat agree	43 (12.7)	5 (5.0) ^a	48 (10.9)
Somewhat disagree or strongly disagree	295 (87.3) ^a	96 (95.0)	391 (89.1)

^a Significance of z test for difference in proportions at 95% level.

NACI. Physicians residing in Québec found Québec Immunization Program guidelines to be influential to their practice.

DISCUSSION

In this study of Canadian physicians, the majority of GPs routinely administered or recommended the HPV vaccine to adults. OB/GYNs counsel, educate, and make recommendations to patients about HPV and the HPV vaccine. Most physicians recognize the benefits of the HPV vaccine across a number of patient types, especially patients with a history of genital warts, female patients with a history of abnormal Pap test results, and female patients being referred for colposcopy. Although most physicians associate the HPV vaccine with the prevention of cervical cancer, genital warts, spread of HPV, and cervical dysplasia, they do not report counselling patients comprehensively about all vaccine benefits.

Physician sex differences were noted in rates of prescriptions and discussions with patients regarding HPV

vaccines. Two possible hypotheses may explain these findings. First, female GPs may have a greater caseload of female patients than male GPs and therefore have more opportunities to prescribe and discuss the HPV vaccine with their patients. A second explanation could be that female GPs are more engaged in issues pertaining to HPV because of a personal interest and as a result have greater HPV knowledge and are more likely to recommend the vaccine to their patients. Our second hypothesis accords with a phenomenon previously described in the literature as the feminization of HPV, whereby HPV has been over-identified as a female-specific disease.²¹

Physicians appear to support the strategy of combined measures for preventing HPV-related cancers. Although nearly all physicians agree that HPV vaccination is an important element of disease prevention, about two thirds of respondents thought that having a Pap test every 3 years is sufficient, and 85% thought that Pap tests are an effective way to prevent cervical cancer. Although the Pap test has been the mainstay of cervical cancer prevention for the past 50 years, it comes with

Table 3. Association of physician gender with HPV practices and knowledge

Item, n (%)	Female (n = 144)	Male (n = 290)	Total (N = 439)
How many times do you discuss HPV and the HPV vaccine with your patients in a typical month?	35.5	22.4 ^a	26.8
How many times do you prescribe or recommend HPV vaccine in a typical month?	48.0	22.1 ^a	30.6
In your opinion, which of the following are potential consequences of HPV infection?			
Genital warts	137 (95.1)	280 (96.6)	421 (98.6)
Cervical cancer	142 (98.6)	286 (98.6)	433 (98.6)
Vulvar cancer	110 (76.4)	217 (74.8)	330 (75.2)
Cervical pre-cancer	136 (94.4)	253 (87.2)	394 (89.7)
Vaginal cancers	98 (68.1)	183 (63.1)	285 (64.9)
Anal cancer	124 (86.1)	216 (74.5) ^a	343 (78.1)
Spread of HPV to sexual partners	126 (87.5)	254 (87.6)	385 (87.7)

^a Significance of z test for difference in proportions or t test for continuous variables at 95% level.

several critical limitations. First, the sensitivity of the Pap test to detect precursor lesions or invasive cervical cancer is only 53%,²² meaning that almost half of affected patients may receive false-negative results, leading to harmful delays in diagnosis and treatment. HPV testing has been shown to lead to lower rates of progression to cancer precursors than Pap testing,²³ but it will likely be subject to the same issues related to nonparticipation.

Despite the presence of organized population-based provincial cervical cancer screening programs in most Canadian provinces, up to 30% of eligible women do not adhere to regular screening guidelines.⁸ Consequently, 37% of squamous cell carcinoma cases and 30% of nonsquamous cell carcinoma cases in 2011-2013 occurred among women who had not received a Pap test in over 5 years or who had never received a

Table 4. Information-seeking behaviour among GPs and OB-GYNs

Item, n (%)	GPs (n=338)	OB-GYNs (n = 101)	Total (N = 439)
Current NACI recommendations regarding HPV vaccination			
Very or somewhat familiar	250 (74.0) ^a	88 (87.1)	338 (77.0)
Not very or not at all familiar	88 (26.0)	13 (12.9) ^a	101 (23.0)
Current NACI recommendations regarding HPV vaccination for those aged 26 and over			
Very or somewhat familiar	225 (66.6) ^a	84 (83.2)	309 (70.4)
Not very or not at all familiar	113 (33.4)	127 (16.8) ^a	130 (29.6)
Current NACI recommendations regarding HPV vaccination of males			
Very or somewhat familiar	218 (64.5)	65 (64.4)	283 (64.5)
Not very or not at all familiar	120 (35.5)	35 (35.6)	156 (35.5)
Current NACI recommendations regarding HPV vaccination of female with a history of pap test abnormalities			
Very or somewhat familiar	221 (65.4)	83 (82.2)	304 (69.2)
Not very or not at all familiar	117 (34.6)	18 (17.8) ^a	135 (30.8)
Current Québec Immunization Program recommendations regarding HPV vaccination (Québec residents only)			
Very or somewhat familiar	49 (62.0)	19 (90.5)	68 (68.0)
Not very or not at all familiar	20 (38.0)	2 (9.5)	32 (32.0)
How influential are current NACI recommendations regarding HPV vaccination to you?			
Very or somewhat influential	296 (87.6)	79 (78.2) ^a	375 (85.4)
Not very or not at all influential	42 (12.4) ^a	22 (21.8)	64 (14.6)

^a Significance of z test for difference in proportions at 95% level.

Pap test.⁸ Given the known limitations of Pap testing, it is surprising that the majority of physicians continue to believe that Pap tests are sufficient and effective measures of cervical cancer prevention.

Although most physicians supported HPV vaccination and showed high levels of knowledge related to HPV, the study did identify several knowledge gaps. For instance, nearly one in 10 physicians expressed concerns regarding vaccine safety, despite the vast amount of evidence showing that the vaccine is extremely safe. HPV vaccine safety data were recently summarized in a statement released by the Global Advisory Committee on Vaccine Safety.¹⁶ Furthermore, although most physicians recognized the benefits of the HPV vaccine across a variety of patient types, one in 10 incorrectly believed there is no point in offering the HPV vaccine once patients have been exposed to HPV.

Despite efforts to gain a representative sample of Canadian physicians, this survey is subject to response bias, whereby the types of physicians who participated in this survey may differ from those who did not. It is possible that physicians with a greater interest in HPV and greater knowledge in this domain opted to participate, in which case the data from this study may overestimate the knowledge of providers and the volume of HPV preventive services offered. An additional limitation is that this survey was administered in May and June of 2016, just before the July 2016 release of updated NACI guidelines, which were accompanied by updated data on the benefits of HPV vaccination for older populations. Therefore, some respondents may not have received the most current guidance on vaccine benefits in older populations.

To our knowledge, this study is the first survey of HPV providers' vaccination practices and HPV knowledge in Canada since the introduction of school-based vaccination programs. Other published surveys related to HPV vaccination have focused mostly on the practice of family physicians and pediatricians in screening adolescent girls in the United States.^{24,25} The results of this study highlight where professional development activities for physicians and health care providers should be directed to increase HPV knowledge and the capacity of providers to offer HPV preventive counselling and vaccination to adults.

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APPENDIX 1. - HPV PHYSICIAN SURVEY

Table legend: The survey consisted of multiple choice (Q1-Q3, Q8, Q13, Q14, Q21); numeric response questions (Q4, Q7, Q10); open-ended questions (Q6a, Q6b, Q19, Q20, Q22); and Likert-scale questions (Q9, Q11-12, 15-19)

Q.1 - Please indicate in what part of Canada you practice?

Q.2 - Please specify your gender

Q.3 - Are you in full-time clinical practice as a General Practitioner or an Obstetrician/Gynecologist?

Q.4 - How many years have you been in full-time clinical practice?

Q.5 - Which types of vaccines do you routinely administer or recommend to adults (18 and over) in your practice?

Q.6a - What is your role with respect to educating patients about HPV?

Q.6b - What is your role with respect to vaccinating patients against HPV?

Q.7 - How often do you discuss HPV and HPV vaccination with your patients?

Q.8 - How do discussions about HPV and HPV vaccination come up?

- I routinely discuss it with all eligible patients
- I tend to discuss HPV most with patients who ask me about it
- I tend to discuss it only with specific patient types [specify]
- Other - specify

Q.9 - Please indicate how beneficial you believe the HPV vaccine is for the following patient types?

(Greatly beneficial, somewhat beneficial, not very beneficial, not at all beneficial)

- Female patients with a history of abnormal Pap test results
- Female patients being referred for a colposcopy
- Female patients with a history of HPV related cancer (cervical, vaginal, vulvar cancer)
- Patients with a history of genital warts
- Patients with a history of anal cancer

Q.10 - How many times do you prescribe or recommend HPV vaccine in a typical month?

- Overall
- Females ages 9-17
- Males ages 9-17
- Females ages 18-26
- Males ages 18-26
- Females ages 27-45
- Males ages 27-45

Q.11 - In general, how well would you say your patients understand HPV and its associated risks?

(Understand very well, understand somewhat well, don't understand very much, don't understand at all)

Q.12 - Please indicate to what extent you agree / disagree with each of the following statements?

(Strongly agree, somewhat agree, somewhat disagree, strongly disagree)

- Having Pap screening every 3 years is sufficient
- Pap tests are an effective way of preventing cervical cancer
- I believe that vaccination is an important aspect of disease prevention
- A large number of my patients are cautious about taking the HPV vaccine even though they accept other vaccines

Q.13 - In your opinion, which of the following benefits (in terms of prevention) do you associate with the HPV vaccine?

- Cervical cancer
- Genital warts
- Cervical dysplasia
- Spread of HPV to sexual partners
- Anal cancer
- Vulvar cancers
- Vaginal cancers

Q.14 - Which of the following consequences / benefits do you counsel your patient about with respect to HPV and HPV vaccination?

- Cervical cancer
- Genital warts
- Cervical dysplasia
- Spread of HPV to sexual partners
- Anal cancer
- Vulvar cancers
- Vaginal cancers

Q.15 - Please indicate to what extent you agree / disagree with each of the following statements?*(Strongly agree, somewhat agree, somewhat disagree, strongly disagree)*

- In general, I do not view HPV as a serious health risk
- HPV affects both men and women
- In general patients are not at risk for HPV if they have only had one sexual partner
- A large proportion of my patients are not really at risk for HPV
- Many of my patients believe HPV is not something that affects someone like them
- Patients don't need to get vaccinated against HPV if they regularly get a Pap test
- If the HPV vaccine was necessary the government would pay for it
- The HPV vaccine doesn't work
- I am concerned about the safety of the HPV vaccine
- When I recommended the HPV vaccine to a patient they usually get vaccinated
- I believe that the only symptom of HPV is genital warts
- I believe the HPV vaccine is only for teenage girls and not for women aged 18 and older
- In general, I believe that there is no point in receiving the HPV vaccine once patients have already been exposed to the HPV virus
- I believe that HPV can be very well prevented by the use of condoms
- I believe that patients do not need the HPV vaccine until they become sexually active

Q.16 - In your experience, to what extent do your patients consider each of the following as barriers to getting vaccinated against HPV?*(Major barrier / moderate barrier / minor barrier / not a barrier at all / don't know / prefer not to answer)*

- Cost/no private insurance
- Potential health risks
- They've never really thought about it
- Perception that the product(s) haven't been around long enough
- General safety concerns
- Access to the vaccine
- They don't know enough about it
- They don't like needles
- Worry about potential side effects
- Negative press about vaccinations in general
- Negative press about the HPV vaccine
- Negative internet sites about HPV vaccine
- They don't agree with vaccination
- Perceptions of lack of efficacy
- They are still undecided

- Too old for the vaccine
- In a stable relationship

Q.17 - To what extent do each of the following represent barriers for you as a physician in discussing and recommending HPV vaccination to your patients?*(Major barrier / moderate barrier / minor barrier / not a barrier at all / don't know / prefer not to answer)*

- Lack of time
- Lack of opportunity to discuss HPV and vaccination with my patients
- I am not comfortable talking about it
- I don't see enough suitable patients
- I am not convinced of the efficacy of the HPV vaccine
- I am not convinced of the safety of the HPV vaccine
- Patient already has HPV / has already been infected
- Patient has normal Pap test results
- Patient is married / in a monogamous relationship
- Patient is at low risk for HPV
- Patient is not sexually active
- HPV vaccine is too expensive / patient does not have insurance coverage
- Patient is too old for the HPV vaccine

Q.18a - Overall how familiar are you with... (Very familiar / somewhat familiar / not very familiar / not at all familiar)

- Current National Advisory Committee on Immunization (NACI) recommendations on HPV vaccination
- Current NACI recommendations regarding HPV vaccination for those aged 26 and over
- Current NACI recommendations regarding HPV vaccination of males
- Current NACI recommendations regarding HPV vaccination of females with a history of Pap abnormalities
- Current Québec Immunization Program recommendations regarding HPV vaccination

Q.18b - Overall, how influential are current NACI recommendation regarding HPV vaccination to you / your practice? (Very influential, somewhat influential, not very influential, not at all influential)**Q.18c - Overall, how influential are current Québec Immunization Program recommendations regarding HPV vaccination HPV vaccination to you / your practice?***(Very influential, somewhat influential, not very influential, not at all influential)*

Q.19 - What resources have you found helpful or would you find helpful in counselling your patients about HPV and HPV vaccination?

- Canadian
- Local
- Global

Q.20 - Are there any educational gaps or unmet needs in terms of the resources available to you in educating or counselling your patients?

- American
- No preference

Q.21- When seeking information on HPV and HPV vaccination, what is the origin of the resources or information you rely on most / find most helpful?

Q.22 - Do you anticipate any changes or trends in HPV infection and / or vaccination in the next 5 years?