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Patient Concerns About Human Papillomavirus Testing and 5-Year Intervals in Routine Cervical Cancer Screening

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Abstract

Objective—To explore attitudes towards new cervical cancer screening options and understand factors associated with those beliefs among women in routine gynecologic care.

Methods—We used an interviewer-administered survey of 551 women aged 36–62 years enrolled in the HPV in Perimenopause Study. Poisson regression with robust error variance was used to estimate prevalence ratios and 95% confidence intervals to compare women's preferences for cervical cancer screening methods and frequency.

Results—A majority of women (55.6%, 95%CI: 51.4–59.8%) were aware that screening recommendations had changed, yet 74.1% (95%CI: 70.3–77.7%) still believed women should be screened annually. If recommended by their doctor, 68.4% (95% CI: 64.4–72.2%) were willing to extend screening to every three years, but only 25.2% (95%CI: 21.9–29.2%) would extend screening to five years. Most women (60.7%, 95%CI: 56.5–65.7%) expressed a strong preference for Pap testing, and 41.4% (95%CI: 37.4–45.6%) expressed at least moderate concern over having an HPV test without a Pap test. A desire for more frequent care, higher degree of worry and perceived risk, and abnormal screening history were all associated with reduced willingness to accept HPV testing and longer screening intervals.

Conclusion—A majority of routinely screened women indicated a willingness to adopt a cervical cancer screening strategy of cytology alone or Pap-HPV co-testing every 3 years if recommended by their physician. However, they remain concerned about HPV testing and extension of screening intervals to once every 5 years. Our results suggest continued reticence to

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accepting newer HPV-based screening algorithms among routinely screened women over age 35 years.

Introduction

In 2012, the US Preventive Services Task Force, American Cancer Society, American Society for Colposcopy and Cervical Cytology, and American Society for Clinical Pathology updated their joint guidelines for cervical cancer screening, specifically recommending *against* annual screening using any strategy (1). Cytology alone at 3-year intervals and HPV co-testing with cytology at 5-year intervals were both considered acceptable strategies for women aged 30–65 years. While primary screening with HPV testing was not in the 2012 guidelines, in April 2014 the US Food and Drug Administration approved the Roche Cobas® HPV test for primary screening, and interim guidelines for a primary HPV screening strategy are anticipated.

HPV co-testing with a 3-year screening interval has been an acceptable option since 2003, yet uptake of co-testing in clinical practice has been slow (2, 3). Studies have shown that despite these guidelines, physicians continue to screen more frequently than recommended (4–9), and surveys have indicated that patient anxiety and expectation of annual screening influence a provider's screening recommendation (10, 11). Because recommendations strive to achieve a balance between benefits and both physical and psychological harms of screening, it is important to assess patient preferences and attitudes towards each alternative cervical cancer screening strategy.

We assessed the attitudes towards HPV testing strategies and patient-specific factors associated with willingness to lengthen screening intervals to 3- or 5-years in a cohort of routinely screened women aged 36–62 years participating in a natural history study of HPV infection during the menopausal transition.

Materials and Methods

A survey to assess knowledge of the cervical cancer screening guideline changes, current screening practices, preferred screening method and frequency, willingness to extend the screening interval, and perceived risk of HPV and cervical cancer was offered to all women completing the HPV in Perimenopause Study final study visit. Five-hundred sixty-six of 885 women enrolled into the HPV in Perimenopause Study (64.0%) completed the final study visit, and 551/566 (97.3%) completed the screening-focused survey. Women who completed the full two years of follow-up did not differ significantly on any of the demographic or baseline risk factor variables from the total 885 women enrolled (Table 1).

Details of the HPV in Perimenopause Study have been reported elsewhere (12, 13). In brief, women receiving routine gynecological care were recruited to participate from Johns Hopkins Hospital affiliated outpatient OB/GYN clinics in Baltimore, MD from March, 2008 to March, 2011. Women were eligible to participate in the study if they were between 35 and 60 years, had an intact cervix, and were willing to provide informed consent. Women were not eligible for enrollment into the study if they were pregnant, had plans to become pregnant, had a history of organ transplantation or were known to be HIV-positive.

During this 2-year prospective natural history study of HPV infection in the menopausal transition, consenting women provided information on socio-demographic characteristics, lifetime sexual history and current sexual behavior, cervical cancer screening history, menstrual and reproductive histories, medication, and alcohol and tobacco use via a telephone-administered questionnaire. All women underwent a speculum-assisted pelvic examination, with swab and secretion samples collected for research purposes. A HIPAA waiver was signed allowing the study to abstract all cervical cytology and HPV test results obtained clinically during their study participation from their medical records. Several patient-specific factors evaluated in this study (including screening history, sexual behavior, and clinical Pap/HPV results) were derived from these data sources. The questions asked to participants in the screening study are included in the Appendix, available online at <http://links.lww.com/xxx>. All study procedures were approved by the Johns Hopkins Bloomberg School of Public Health Institutional Review Board.

Descriptive statistics including frequencies and proportions and their corresponding confidence intervals were estimated to summarize survey responses. Poisson regression with robust error variance was used to estimate unadjusted prevalence ratios (PRs) and corresponding 95% confidence intervals (95% CI) comparing women willing to be screened every three years (by Pap only or by Pap/HPV co-testing) to women unwilling to extend screening intervals beyond one year. Women willing to extend screening to every five years following a dual negative co-test were also compared to women only willing to extend to three years. Women preferring Pap testing only were compared to women preferring HPV testing only or who didn't express a preference. All analyses were carried out in Stata version 13.1.

Results

The women in this analysis were between 36 and 62 years of age with a median age of 50 (IQR: 44–55) at the time of the screening survey administration. The majority of women were white (76.2%), married (64.7%) and currently non-smokers (91.8%) (Table 1). Many women (60.9%) reported having five or more lifetime sex partners and at the time of the final visit, 70.0% reported sex with a steady partner, 25.5% were not sexually active, and 4.6% reported having a new sex partner in the prior six months. Most participants had some education beyond high school (85.0%), with 64.6% completing college and/or a post-graduate degree and 80.1% reported household incomes of \$40,000 or higher. Consistent with our planned recruitment from women attending routine OB/GYN visits, all women reported having had a prior Pap smear, 47.2% reported having an abnormal Pap smear prior to study enrollment, and 99% reported having a Pap smear within the past three years. In addition to OB/GYN care, participants were actively engaged in other medical care—less than 1% of women reported that their OB/GYN was their primary care physician and 97.6% had a check-up or physical in the past 5 years (Table 2). Additionally, 92.2% of women reported cholesterol tests, 75.1% reported diabetes screens, and 88.4% mammograms in the past 5 years.

A majority of participants (55.6%, 95%CI: 51.4–59.8) were aware that current cervical cancer screening guidelines recommended against annual screening (Table 2). However,

when asked how often they thought women their age should have a Pap smear, 3.8% (95% CI: 2.5–5.8) reported more than once a year, 74.1% (95% CI: 70.3–77.7) reported yearly, 13.4% (95% CI: 10.8–16.6) reported every other year, and 6.4% (95% CI: 4.6–8.7) reported every three years or longer. Despite a majority believing that screening should occur annually, over two-thirds of participants (68.4%, 95% CI: 64.4–72.2) were willing to extend their screening to once every three years by either Pap only or Pap-HPV co-testing following a normal result if a doctor recommended it; however, among those women willing to be screened every three years, only 39.5% (95% CI: 34.5–44.7), which was 25.2%, (95% CI: 21.8–29.0,) of women overall, were willing to extend screening to 5 years. Over two-thirds of participants (69.7%, 95% CI: 65.7–73.4) indicated that they would continue annual OB/GYN well-woman visits even if Pap screening was not performed. This proportion remained unchanged when restricted to the women willing to be screened every three years or longer. Primary reasons cited for continuing annual visits included a desire for routine check-up/physical exam, other gynecologic concerns, breast exams, to maintain relationships with their doctor, and reassurance that everything is okay.

When asked about screening test preference, 60.7% (95% CI: 56.5–65.7) of women preferred Pap smears only, 31.5% (95% CI: 27.7–35.5) did not have a preference and were willing to be screened by either Pap or HPV testing, and only 7.8% (95% CI: 5.9–10.4) preferred HPV testing alone (Table 2). Furthermore, 30.1% (95% CI: 26.4–34.1) of women reported they would experience moderate anxiety and 11.3% (95% CI: 8.9–14.3) reported severe anxiety if they were screened with an HPV test alone. When asked which test result they found more concerning, 26.6% (95% CI: 23.0–30.4) said an abnormal Pap result and 9.3% (95% CI: 7.1–12.0) reported an HPV positive result, with the majority reporting them to be equally concerning. To understand factors associated with screening assay preference, univariate analyses compared women who preferred Pap testing alone to the women who didn't have a preference or preferred HPV testing (Table 3). Women with a higher household income (PR: 0.56, 95% CI: 0.35–0.90), women recruited from the clinic that routinely co-tests (PR: 0.80, 95% CI: 0.69–0.93), women who were more concerned about an HPV positive test (PR: 0.45, 95% CI: 0.31–0.66) or equally concerned about an abnormal Pap/HPV result (PR: 0.73, 95% CI: 0.65–0.83), or thought they had a moderate or high risk of HPV (PR: 0.67, 95% CI: 0.49–0.92) were more likely to not have a test preference or to prefer HPV only compared with preferring Pap testing alone. Women with moderate (PR: 1.54, 95% CI: 1.25–1.90) or severe (PR: 1.39, 95% CI: 1.07–1.80) concern about HPV only testing preferred Pap only testing compared with women with low/no concern about HPV only testing.

In univariate analyses, we saw little to no difference in willingness to be screened every three years versus annually by age, race, marital status, education, and menopausal status (Table 4). Women with household income below \$40,000 were 30% more likely (PR: 1.3, 95% CI: 1.1–1.5) to agree to extended screening intervals than women with higher income. Women seen at clinic B (which instituted a clinic-wide co-test policy in 2009) were more likely to agree to extended intervals (PR: 1.2, 95% CI: 1.1–1.4) compared with women recruited from clinic A which did not have a consensus co-testing policy. Participants' knowledge and attitudes towards cervical cancer screening, as well as self-reported screening history, were among the strongest predictors of whether a woman was willing to

be screened every three years. Both women who had last been screened longer than a year ago (PR: 1.3, 95% CI: 1.2–1.5) and women who didn't expect to have their next Pap smear screening for at least one year (PR 1.4, 95% CI: 1.2–1.5 next screen within 2 years; PR 1.4, 95% CI: 1.1–1.7 next screen within 5 years) were 30–40% more likely to agree to a 3-year screening interval. Women who believed Pap smears should be done every other year (PR: 1.3 95% CI: 1.2–1.5) or every 3–5 years (PR 1.5, 95% CI: 1.4–1.7) were also significantly more likely to state they would accept extended screening intervals than those who thought screening should be yearly or more often. Prior knowledge of the change in screening guideline was not associated with an increased willingness to follow the new guidelines. Women with a history of an abnormal Pap smear in the last 5 years were at least 30% less likely to agree to extended intervals (PR: 0.7, 95%CI: 0.5–0.9 extend to 3 years; PR: 0.5, 95% CI: 0.2–1.0 extend to 5 years). Women who reported a moderate to high perceived risk of developing cervical cancer in the future were 30% less willing to extend screening intervals to 3 years (PR: 0.7, 95% CI: 0.6–0.9), but no association was seen with perceived risk of HPV infection or genital warts. Risk factors for HPV infection and cervical cancer such as lifetime number of sex partners, recent new sex partners, HPV serology status, and HPV DNA status were also not associated with a woman's willingness to follow the 3-year screening recommendation.

Only 39.5% (95%CI: 34.5–44.7) of women willing to be screened every three years (25.2%, 95%CI: 21.8–29.0 of all women) were willing to be screened every 5 years (Table 4). Women with a BMI over 30 were 50% more likely to accept a 5-year interval (PR: 1.5, 95% CI: 1.1–2.0). Many of the same determinants of willingness to extend to 3-year intervals were associated with willingness to extend to 5-year intervals though these associations did not reach statistical significance in this smaller sample. No significant associations were seen with risk factors of lifetime number of sex partners, new sex partners, HPV serology status, and HPV DNA status.

Discussion

Cervical cancer screening has evolved significantly in the past 10–15 years. However, the preference of women regarding alternative screening strategies is an understudied aspect of changing screening guidelines. In our survey of routinely screened women 36–62 years, we found that almost half were aware that screening recommendations had changed, and the majority still believed women should be screened every year. Despite this, two thirds stated they would be willing to extend screening to every three years if their doctor recommended it, but only a quarter were willing to extend the interval to five years following a dual negative co-test, the preferred recommendation in the newest guidelines. Women also expressed a clear preference for Pap testing over HPV testing, and many expressed concern over having an HPV test alone without a Pap test. A desire for more frequent care, higher anxiety, and higher perceived risk were all associated with being less willing to accept alternatives to annual Pap smears.

Resistance to less frequent screening has been reported previously (14–21), and this reticence appears to persist over time. For example, the results from a nationally representative survey of women in the US in 2005 were strikingly similar to our survey

results collected almost a decade later (15). Our results suggest a continued preference for cytology testing compared with HPV testing. This observation is especially relevant in light of the recent FDA approval of one HPV test (Roche Cobas) for an indication of primary cervical cancer screening (22). Future US guideline revisions are likely to consider recommendations for primary screening using HPV testing, especially given the transition to primary HPV screening by other large national screening programs such as those in Australia (23) and the United Kingdom (24).

Interestingly, despite the preference for Pap over HPV testing, women in our study were more concerned about an abnormal Pap test compared to a positive HPV test. Data from a large study of women routinely screened with an HPV co-test algorithm showed 35% of CIN3/AIS and 29% of total cancers were in women with HPV positive and cytology negative co-test results (25). Taken together, these results suggest that educational interventions to communicate risks associated with alternative screening test results are needed in order for women to make understand alternative screening choices.

Women with a lower household income were more likely to accept longer screening intervals, which may be related to the cost saving aspect of reducing unnecessary tests or other barriers such as difficulty scheduling time off work for preventative health care needs. In addition, women with high levels of worry, high perceived risk, or both, as well as women who indicated a preference for more care and contact with their provider were less likely to agree to extended screening intervals, as previously shown (14, 26). These women may represent a combination of those with historically high risk, who should be screened more frequently (27), as well as a subset of ‘worried well’ in whom frequent screening appears to be the result of a desire for continual reassurance.

Surveys of physicians have indicated that concern about losing the well-woman annual clinical encounters as a result of less frequent screening was a common barrier to use of co-testing strategies, which are cost-effective only when performed at the recommended extended intervals (8, 28). It is important to understand whether a lack of willingness to extend the cervical cancer screening interval reflects a concern among the patients about missing other opportunities for care. We found that nearly 70% of women reported that they would continue annual well-women visits even if a Pap smear was not taken at each visit. However, our questions did not explicitly ask about willingness to extend screening intervals in the context of continued annual gynecologic exams, and thus it is possible that acceptance would be higher if women are reassured that less frequent screening would not result in less frequent general gynecologic care.

A unique strength of our analysis was the ability to nest responses into a larger and more comprehensive evaluation of the natural history of HPV infection. For example, women in this study were primarily recruited from two GYN practices, which had distinctly different screening policies. We observed that women recruited from the clinic with a practice-wide policy of routine co-testing in women over 30 since 2009 were slightly more likely to accept extended intervals than those being screened in the other clinics with less frequent use of co-testing. However, having had one or more HPV tests or being in the clinic with a policy of routine co-testing was not associated with a woman being more comfortable with HPV only

testing, again highlighting a need for more patient education regarding the use and meaning of HPV testing.

A limitation of this cohort is that it is not representative of the general population. Our study participants are older, of higher socio-economic status, and are in routine screening. Despite this, we believe that the responses from this population are particularly relevant when the aim is to examine the attitudes towards changes in routine screening guidelines, since it is the well-screened women who would be most affected by extension of screening intervals. Moving forward, it will be important to assess whether more diverse or representative populations also express similar attitudes towards screening strategies. We also acknowledge that screening involves a dialog between patient and provider, and we have only provided the patient perspectives. Future studies incorporating both patient and provider perspectives will be essential for a complete evaluation of the dynamics of this shared decision-making. In addition, many of the questions were phrased as screening intentions and future behaviors, and it is thus unclear whether these intentions will directly translate to practice. All of the information collected in our questionnaire are self-reported and so are subject to inaccuracies in recall and reporting. Despite these limitations, these data contribute to a significant gap in the evidence regarding patient perceptions of benefits and harms of screening, which have been historically underrepresented in cervical cancer screening guideline development.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Comparison of Total Enrollment Population with Women Completing Study

	Completed study		Enrollment Population	
	n	%	n	%
Demographics				
Age (years)				
35–39	95	17.2	162	18.3
40–44	112	20.3	187	21.1
45–49	143	26.0	223	25.2
50–54	120	21.8	181	20.5
55–60	81	14.7	132	14.9
Race				
White	420	76.2	653	73.8
Black	91	16.5	167	18.9
Other	40	7.3	65	7.3
BMI				
Normal	351	39.7	222	40.5
Overweight	263	29.8	177	32.3
Obese	270	30.5	149	27.2
Income (\$)				
<40,000	35	6.4	66	7.5
40–80,000	125	22.7	212	24.0
80–120,000	133	24.2	195	22.0
120,000+	183	33.3	261	29.5
Unknown	74	13.5	150	16.9
Clinic				
Clinic A (no co-test policy)	293	53.3	449	50.7
Clinic B (co-test policy)	224	40.7	385	43.5
Clinic C (no co-test policy)	33	6.0	51	5.8
Married				
Never	84	15.3	164	18.6
Divorced/Widowed/Separated	110	20.0	165	18.7
Married	356	64.7	555	62.8
Education				
High school or less	82	15.0	153	17.3
Some post high school	112	20.4	208	23.5
College graduate	171	31.2	257	29.0
Post graduate	183	33.4	267	30.2
Smoking				
Never	393	71.9	608	68.7
Former	109	19.9	176	19.9
Current	45	8.2	101	11.4

	Completed study		Enrollment Population	
	n	%	n	%
Menopausal Status (BL)				
Premenopausal	224	40.7	373	42.2
Perimenopausal	165	30.0	260	29.4
Postmenopausal	149	27.0	233	26.3
Not Classified	13	2.4	19	2.2
Screening History				
Time Since Last Abnormal Pap (BL)				
Never abnormal	291	52.8	465	52.5
0–5 years	62	11.3	114	12.9
6+ years	182	33.0	286	32.3
Unknown	16	2.9	20	2.3
Ever Had Colposcopy (BL)				
No	417	76.1	694	78.4
Yes	131	23.9	191	21.6
Risk Factors				
Lifetime Number of Sex Partners at Enrollment				
<5	214	39.1	335	38.0
5+	333	60.9	547	62.0
Recent Sex				
No Sex	140	25.5	199	22.6
Yes, no new partner	385	70.0	655	74.5
Yes, new partners	25	4.6	25	2.8
HPV Serology at BL				
Negative	190	40.9	273	37.9
Positive	275	59.1	448	62.1
Research HPV Testing (during study)				
Always negative	448	81.3	735	83.1
Ever positive	103	18.7	150	16.9
Clinical Pap Abnormality (during study)				
No	507	93.2	811	93.1
Yes	37	6.8	60	6.9
Clinical HPV Test (during study)				
Always negative	318	58.4	476	54.6
Ever positive	26	4.8	42	4.8
Not tested	201	36.9	354	40.6

* $p > .05$ for all comparisons between visits (no significant differences)

Abbreviations: N= number, %= percent, BL=baseline, indicates data only collected at time of study enrollment, Recent Sex= within the last 6 months

Missing data: N=3 for smoking, education, ever had colposcopy; N=1 for recent sex; N=10 for Pap result during study; N=6 for clinical HPV test; N=86 for serology (unable to get blood sample)

Table 2**Knowledge, Attitudes, and Preferences towards Cervical Cancer Screening & Guidelines**

	n	%	95% CI
How often should women have a Pap smear?			
Yearly	408	74.1	70.3–77.7
Every other year	74	13.4	10.8–16.6
Every 3 or longer	35	6.4	4.6–8.7
More than once a year	21	3.8	2.5–5.8
Don't know	13	2.4	1.2–3.8
Aware of the guideline change?			
No	240	43.6	39.5–47.8
Yes	306	55.6	51.4–59.8
Don't Know	5	0.9	0.3–1.9
Would still have an annual without a Pap			
No	132	24.1	20.7–27.9
Yes	382	69.7	65.7–73.4
Don't Know	34	6.2	4.5–8.6
Screening Test preference			
Pap Only	333	60.7	56.5–65.7
HPV Only	43	7.8	5.9–10.4
Either	173	31.5	27.7–35.5
Which is more concerning			
Abnormal Pap	146	26.6	23.0–30.4
HPV Positive	51	9.3	7.1–12.0
Equally concerning	353	64.2	60.1–68.1
If HPV test only, how much concern about not having a Pap smear			
None	120	21.9	18.6–25.6
Slight	201	36.7	32.7–40.8
Moderate	165	30.1	26.4–34.1
Severe	62	11.3	8.9–14.3
Perceived Risk of Warts			
None/Low	518	95.1	92.9–96.6
Moderate/High	27	5.0	3.4–7.1
Perceived Risk of HPV			
None/Low	492	89.6	86.8–91.9
Moderate/High	57	10.4	8.1–13.2
Perceived Risk of Cervical Cancer			
None/Low	475	86.5	83.4–89.1
Moderate/High	74	13.5	10.9–16.6
Willing to be screened every 3 years by either Pap only or co-testing			
No	174	31.6	27.8–35.6
Yes	377	68.4	64.4–72.2

	n	%	95% CI
If willing to be screened every 3 years, willing to extend to 5 years			
No	213	60.5	55.3–65.5
Yes	139	39.5	34.5–44.7
Have pap every 5 years if Pap & HPV tests normal			
No	412	74.8	71.0–78.2
Yes	139	25.2	21.8–29.0
Other Health Behaviors			
Primary care provider?			
Internist/Family Practitioner	476	86.4	83.3–89.0
Physician's Assistant	18	3.3	2.1–5.1
Nurse Practitioner	14	2.5	1.5–4.3
Gynecologist	5	0.9	0.4–2.2
Other Medical Specialist	7	1.3	0.6–2.6
Don't know/can't remember	3	0.5	0.2–1.7
No primary care provider	28	5.1	3.5–7.3
In the last 5 years had a ...			
General health check-up or physical	538	97.6	96.0–98.6
Cholesterol test	508	92.2	89.6–94.2
Diabetes screen or blood glucose test	417	75.7	71.9–79.1
Dental Exam	527	95.6	93.6–97.1
Clinical breast exam	534	96.9	95.1–98.1
Mammogram	487	88.4	85.4–90.8

* Abbreviations: N=number, %=percent;

Missing data: N=3 for annual w/o Pap, HPV only; N=2 test preference; N=1 concern

Table 3

Correlates of Preference of Pap Only Screening (compared to HPV only or either)

	n (%)	PR	CI
Demographics			
Age			
35–39	59 (62.1)	1	
40–44	61 (54.5)	0.88	.70–1.11
45–49	85 (59.4)	0.96	.78–1.18
50–54	81 (68.1)	1.10	.90–1.34
55–60	47 (58.8)	0.95	.74–1.20
Race			
White	256 (61.0)	1	
Black	53 (58.9)	0.97	.80–1.17
Other	24 (61.5)	1.01	.78–1.31
BMI			
Normal	140 (63.4)	1	
Overweight	108 (61.4)	0.97	.83–1.13
Obese	84 (56.4)	0.89	.75–1.06
Income (\$)			
<40,000	268 (60.9)	1	
40,000+	12 (34.3)	0.56	.35–.90
Unknown	53 (71.6)	1.16	1.0–1.38
Clinic			
Clinic A (no co-test policy)	195 (66.8)	1	
Clinic B (co-test policy)	120 (53.6)	0.80	.69–.93
Clinic C (no co-test policy)	18 (54.6)	0.88	.59–1.13
Married			
Never	50 (59.5)	1	
Divorced/Widowed/Separated	66 (60.0)	1.01	.80–1.27
Married	216 (61.0)	1.03	.84–1.25
Education			
High school or less	44 (53.7)	1	
Some post high school	70 (62.5)	1.16	.91–1.49
College graduate	104 (60.8)	1.13	.90–1.43
Post graduate	114 (63.0)	1.17	.93–1.48
Smoking			
Never	241 (61.6)	1	
Former	64 (58.7)	0.95	.80–1.14
Current	27 (58.7)	0.95	.74–1.23
Menopausal Status			
Premenopausal	134 (59.8)	1	
Perimenopausal	103 (62.4)	1.04	.89–1.22

	n (%)	PR	CI
Postmenopausal	90 (61.2)	1.02	.87–1.21
Not classified	6 (46.2)	0.77	.42–1.40
Screening History			
Time Since Last Abnormal Pap (BL)			
No abnormal Pap ever	176 (60.7)	1	
0–5 years	38 (61.3)	1.01	.81–1.26
6+ years	112 (61.9)	1.02	.88–1.18
Unknown	7 (43.8)	0.72	.41–1.27
Ever Colposcopy (BL)			
No	255 (61.3)	1	
Yes	77 (59.2)	0.97	.82–1.14
When was last Pap			
Within last year	266 (61.9)	1	
1–5 years ago	65 (56.5)	0.91	.77–1.09
Don't Know	1 (33.3)	0.54	.11–2.68
Next Expected Pap			
Within a year	273 (62.1)	1	
Within 2 years	49 (61.3)	0.99	.82–1.19
Within 5 years	5 (33.3)	0.54	.26–1.10
Don't Know	6 (42.9)	0.69	.38–1.27
Risk Factors			
Lifetime Number of Sex Partners (BL)			
<5	128 (60.4)	1	
5+	204 (61.3)	1.01	.88–1.17
Recent Sex *			
No sex	84 (60.0)	1	
Yes, no new partner	235 (61.4)	1.02	.87–1.20
Yes, new partners	14 (56.0)	0.93	.65–1.36
HPV Serology at BL			
Negative	120 (63.5)	1	
Positive	162 (59.1)	0.93	.80–1.08
Research HPV Status (during study)			
Always negative	277 (62.0)	1	
Ever positive	56 (54.9)	0.89	.73–1.07
Clinical Pap Abnormality (during study)			
No	311 (61.6)	1	
Yes	19 (51.4)	0.83	.60–1.15
Clinical HPV Testing (during study)			
Negative	182 (57.6)	1	
Positive	10 (38.46)	0.67	.41–1.10
Not Tested	138 (68.7)	1.19	1.04–1.36

	n (%)	PR	CI
Knowledge and Attitudes towards Cervical Cancer Screening & Guidelines			
How often should women have Pap smear?			
Yearly	262 (64.5)	1	
Every other year	40 (54.1)	0.84	.67–1.05
Every 3–5 years	16 (45.7)	0.71	.49–1.02
More than once a year	12 (57.1)	0.89	.61–1.29
Don't know	2 (16.7)	0.26	.07–.92
Aware of the guideline change?			
No	143 (59.6)	1	
Yes	186 (61.2)	1.03	.89–1.18
Don't Know	3 (75.0)	1.26	.71–2.24
Willing to have annual without Pap			
No	78 (59.1)	1	
Yes	231 (60.6)	1.03	.87–1.21
Don't Know	23 (67.7)	1.14	.87–1.50
Which is more concerning			
Abnormal Pap	114 (78.1)	1	
HPV Positive	18 (35.3)	0.45	.31–.66
Equally concerning	201 (57.1)	0.73	.65–.83
If HPV test only, how much concern about not having a Pap smear			
None	57 (47.5)	1	
Slight	114 (56.7)	1.19	.95–1.49
Moderate	120 (73.2)	1.54	1.25–1.90
Severe	41 (66.1)	1.39	1.07–1.80
Perceived Risk of Warts			
None/Low	316 (61.2)	1	
Moderate/High	13 (48.2)	0.79	.53–1.17
Perceived Risk of HPV			
None/Low	307 (62.7)	1	
Moderate/High	24 (42.1)	0.67	.49–.92
Perceived Risk of Cervical Cancer			
None/Low	290 (61.3)	1	
Moderate/High	42 (56.8)	0.93	.75–1.14

* Abbreviations: N=number, %=percent, BL=baseline,

Boldface data indicate $p < 0.05$.

Table 4

Correlates of willingness to extend cervical cancer screening intervals

Demographics	Extend to 3 years only		Extend from 3 to 5 years	
	n (%)	PR	n (%)	PR
Age (years)				
35–39	67 (70.5)	1	28 (43.1)	1
40–44	65 (58.0)	0.8	34 (54.0)	1.3
45–49	102 (71.3)	1.0	29 (31.2)	0.7
50–54	82 (68.3)	1.0	25 (33.8)	0.8
55–60	61 (75.3)	1.1	23 (40.4)	0.9
Race				
White	298 (80.0)	1	108 (38.9)	1
Black	55 (60.4)	0.9	20 (40.0)	1.0
Other	24 (60.0)	0.9	11 (45.8)	1.2
BMI				
Normal	152 (68.5)	1	49 (34.0)	1
Overweight	126 (71.2)	1.0	45 (38.8)	1.1
Obese	97 (25.9)	1.0	45 (50.0)	1.5
Income (\$)				
<40,000	30 (85.7)	1.3	15 (55.6)	1.5
40,000+	301 (68.3)	1	106 (37.2)	1
Unknown	46 (61.3)	0.9	18 (45.0)	1.2
Clinic				
Clinic A (no co-test policy)	183 (62.5)	1	62 (36.1)	1
Clinic B (co-test policy)	172 (76.4)	1.2	67 (41.9)	1.2
Clinic C (no co-test policy)	22 (66.7)	1.1	10 (50.0)	1.4
Married				
Never	57 (67.9)	1	21 (39.6)	1
Divorced/Widowed/Separated	74 (67.3)	1.0	29 (42.0)	1.1
Married	245 (68.8)	1.0	89 (38.9)	1.0

	Extend to 3 years only		Extend from 3 to 5 years	
	n (%)	PR	CI	PR
Education				
High school or less	61 (74.4)	1	18 (32.7)	1
Some post high school	77 (68.8)	0.9	0.8–1.1	34 (48.6)
College graduate	113 (66.1)	0.9	0.8–1.1	37 (35.2)
Post graduate	124 (67.8)	0.9	0.8–1.1	50 (51.7)
Smoking				
Never	266 (67.7)	1	96 (38.9)	1
Former	74 (67.3)	1.0	0.9–1.2	27 (38.0)
Current	35 (76.1)	1.1	0.9–1.3	16 (50.0)
Menopausal Status				
Premenopausal	151 (67.4)	1	60 (41.1)	1
Perimenopausal	109 (66.1)	1.0	0.9–1.1	42 (41.6)
Postmenopausal	106 (71.1)	1.1	0.9–1.2	35 (36.8)
Not classified	11 (84.6)	1.3	1.0–1.6	2 (20.0)
Screening History				
Time Since Last Abnormal Pap (BL)				
Never abnormal	214 (73.5)	1	90 (44.8)	1
0–5 years	31 (50.0)	0.7	0.5–0.9	6 (21.4)
6+ years	121 (66.5)	0.9	0.8–1.0	41 (36.3)
Unknown	11 (68.8)	0.9	0.7–1.3	2 (20.0)
Ever Colposcopy (BL)				
No	299 (71.7)	1	114 (41.0)	1
Yes	76 (58.0)	0.8	0.7–1.0	25 (34.7)
When was last Pap				
W/in last year	277 (64.1)	1	97 (37.5)	1
1–5 years ago	96 (83.5)	1.3	1.2–1.5	40 (44.9)
Don't Know	3 (100)	1.6	1.5–1.7	1 (33.3)
Next Expected Pap				
Within a year	280 (63.4)	1	96 (36.2)	1
Within 2 years	70 (87.5)	1.4	1.2–1.5	27 (43.6)

	Extend to 3 years only		Extend from 3 to 5 years	
	n (%)	PR	CI	CI
Within 5 years	13 (86.7)	1.4	1.1–1.7	1.1 (84.6) 2.3 1.8–3.1
Don't Know	14 (100)	1.6	1.5–1.7	5 (41.7) 1.2 0.6–2.3
Risk Factors				
Lifetime Number of Sex Partners (BL)				
<5	146 (68.2)	1		58 (41.7) 1
5+	229 (68.8)	1.0	0.9–1.1	81 (38.4) 0.9 0.7–1.2
Recent Sex *				
No sex	106 (75.7)	1		40 (40.8) 1
Yes, no new partner	256 (66.5)	0.9	0.8–1.0	93 (38.9) 1.0 0.7–1.3
Yes, new partners	15 (60.0)	0.8	0.6–1.1	6 (40.0) 1.0 0.5–1.9
HPV Serology at BL				
Negative	135 (71.1)	1		49 (39.5) 1
Positive	183 (66.6)	0.9	0.8–1.1	68 (39.5) 1.0 0.8–1.3
Research HPV Testing (during study)				
Always negative	310 (69.2)	1		109 (37.7) 1
Ever positive	67 (65.1)	0.9	0.8–1.1	30 (47.6) 1.3 0.9–1.7
Clinical HPV Testing (during study)				
Always negative	225 (70.6)	1		87 (41.2) 1
Ever positive	20 (76.9)	1.1	0.9–1.4	9 (47.4) 1.1 0.7–1.9
Not Tested	128 (63.7)	0.9	0.8–1.0	42 (35.6) 0.8 0.6–1.1
Pap Abnormality (BL)				
No	348 (69.1)	1		131 (40.6) 1
Yes	22 (59.5)	0.9	0.7–1.1	7 (31.8) 0.8 0.4–1.5
Knowledge and Attitudes towards Cervical Cancer Screening & Guidelines				
How often should women have Pap smears?				
Yearly	260 (63.7)	1		86 (35.0) 1
Every other year	62 (83.8)	1.3	1.2–1.5	23 (39.7) 1.1 0.8–1.6
Every 3–5 years	34 (97.1)	1.5	1.4–1.7	19 (61.3) 1.8 1.3–2.4
More than once a year	9 (42.9)	0.7	0.4–1.1	5 (71.4) 2.0 1.2–3.4

	Extend to 3 years only		Extend from 3 to 5 years	
	n (%)	PR	CI	PR
Don't know	12 (100)	1.5	1.2–1.7	6 (60.0) 1.7 1.0–2.9
Aware of the guideline change?				
No	157 (65.4)	1		60 (40.5) 1
Yes	217 (70.9)	1.1	1.0–1.2	77 (38.3) 0.9 0.7–1.2
Don't Know	2 (50.0)	0.9	0.5–1.9	1 (50.0) 1.6 0.7–3.8
Have annual w/o pap				
No	105 (79.6)	1		43 (43.4) 1
Yes	245 (64.1)	0.8	0.7–0.9	82 (36.0) 0.8 0.6–1.1
Don't Know	25 (73.5)	0.9	0.7–1.2	14 (60.9) 1.4 0.9–2.1
Test preference				
Pap Only	211 (63.4)	1		64 (33.0) 1
HPV Only	27 (62.8)	1.0	0.8–1.3	10 (38.5) 1.2 0.7–2.0
Either	138 (79.8)	1.3	1.1–1.4	64 (48.9) 1.5 1.1–1.9
Which is more concerning				
Abnormal Pap	99 (67.8)	1		35 (37.6) 1
HPV Positive	40 (78.4)	1.2	1.0–1.4	14 (38.9) 1.0 0.6–1.7
Equally concerning	238 (67.4)	1.0	0.9–1.1	90 (40.4) 1.1 0.8–1.5
If HPV test only, how much concern about not having a Pap smear				
None	103 (85.8)	1		48 (49.5) 1
Slight	147 (73.1)	0.9	0.8–1.0	52 (38.0) 0.8 0.6–1.0
Moderate	90 (54.6)	0.6	0.5–0.7	29 (34.5) 0.7 0.5–1.0
Severe	35 (56.5)	0.7	0.5–0.8	10 (31.3) 0.6 0.4–1.1
Perceived Risk of Warts				
None/Low	357 (68.9)	1		132 (39.4) 1
Moderate/High	17 (63.0)	0.9	0.7–1.2	5 (35.7) 0.9 0.4–1.9
Perceived Risk of HPV				
None/Low	339 (68.9)	1		122 (38.4) 1
Moderate/High	38 (66.7)	1.0	0.8–1.2	17 (50.0) 1.3 0.9–1.9
Perceived Risk of Cervical Cancer				
None/Low	338 (71.2)	1		119 (37.7) 1

	Extend to 3 years only		Extend from 3 to 5 years	
	n (%)	PR	n (%)	PR
Moderate/High	39 (68.7)	0.7	20 (55.6)	1.5

* Abbreviations: N=number, %=percent, BL=baseline.
Boldface data indicate p<0.05.