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Correlating knowledge of cervical cancer prevention and human papillomavirus with compliance after colposcopy referral

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Abstract

Objective—To assess the impact of knowledge of cervical cancer biology and prevention as well as noncognitive measures on compliance with colposcopy referral in a high risk population.

Methods—Participants in a U.S. cohort of women with human immunodeficiency virus (HIV) and at risk comparison women completed behavior questionnaires and instruments measuring knowledge of cervical cancer prevention, depressive symptoms, trust in doctors, and perceived

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Conflict of Interest Statement

The authors declare that there are no conflicts of interest.

stress. Examinations including Pap tests also were conducted. Associations with compliance with resulting indicated colposcopy were assessed in multivariable models.

Results—Of 326 women with indicated colposcopy, 222 (68%) were compliant with colposcopy referral and 104 (32%) noncompliant. In multivariable analysis, better colposcopy compliance was associated with less education (O.R. for compliance 2.24, 95% C.I. 1.12–4.51 vs more than high school), prior abnormal Pap (O.R. per prior abnormal Pap 1.08 95% C.I. 1.01–1.15), study site (O.R. for site with best vs worst compliance 16.1, 95% C.I. 2.91–88.6), and higher stress (O.R. for Perceived Stress Scale-10 score >16 vs lower 3.25, 95% C.I. 1.45–7.26).

Conclusion—Noncognitive factors and how sites manage abnormal Pap testing affect colposcopy compliance. Educational interventions alone are unlikely to improve colposcopy compliance in similar high-risk populations.

Keywords

HPV; cervical cancer prevention; Pap test; health education; perceived stress; HIV in women

Introduction

Infection with human papillomaviruses (HPVs) causes cervical cancer, but effective screening for and treatment of cancer precursors can reduce cancer risk. This is true even among women with the human immunodeficiency virus (HIV), whose immunodeficiency results in high rates of HPV infection and cervical intraepithelial neoplasia (CIN, 1–5). Successful cancer prevention requires navigating a complex process, potentially including HPV vaccination, repeated Pap screening, colposcopic triage for abnormal results, and cervical therapy for cancer precursors (6). Opportunities for loss to follow-up occur at each step, increasing cancer risk. While most cervical cancers in the U.S. occur in inadequately screened women, a substantial minority result from inadequate follow up of abnormal screening results, including colposcopy referral. Noncompliance with recommended colposcopy is especially common among women at highest risk for cervical cancer, including minority and economically disadvantaged women and those with HIV (7, 8).

Several studies have described interventions to improve colposcopy compliance. Women with HIV, like HIV uninfected women of similar background, have significant knowledge deficits related to HPV, cervical cancer prevention, and HPV vaccination (9–14). This is true despite repeated visits for management of abnormal Pap tests and cervical cancer precursors, perhaps because underlying educational deficits are a barrier to understanding cancer prevention messages (14). If better informed patients are more likely to comply with cervical cancer prevention interventions, then educational interventions should improve compliance. Results of knowledge surveys and educational interventions are conflicting (15–20).

Understanding the determinants of health behaviors is especially important in the care of individuals with HIV. Substance abuse, compliance with antiretroviral therapy, and safer sexual practices can all modify the course or transmission risk of HIV disease. To explore factors that underlie colposcopy compliance in high risk women, we explored the correlations between those factors and colposcopy compliance, with special attention to previously little studied factors including knowledge about cervical cancer prevention and noncognitive factors such as stress, depression, and trust in providers. To assess whether any effect was specific to colposcopy, we also evaluated possible links between cervical cancer prevention knowledge and compliance with self-reported condom use to prevent HIV transmission.

Methods

This investigation was part of the Women's Interagency HIV Study (WIHS), an ongoing multicenter prospective cohort study of the natural and treated history of HIV infection and related health conditions among HIV seropositive women and at-risk HIV uninfected comparison women. The protocols, recruitment processes, procedures, and demographics of the WIHS have been described (21, 22). Enrollment began with 2,623 women in 1994 at 6 study consortia (Bronx, Brooklyn, Chicago, Los Angeles, San Francisco, and Washington, D.C.), with expansion to 3,766 women during 2001–2002 (22). Written informed consent was obtained after local human subjects committees approved. HIV status was determined by Western blot at study entry for all participants and semiannually thereafter for those initially seronegative.

In WIHS, women are interviewed twice yearly about medical history and behaviors and undergo an examination, including pelvic exam with Pap test. Follow up continues, but this analysis includes information from previously reported cross sectional questionnaires first administered between April 1, 2007, and October 9, 2007 (14); respondents were provided with written answers and explanations immediately after completion. The 44-item questionnaire included items related to knowledge of HPV, risk factors for cervical cancer, the HPV vaccine, and care following abnormal Pap smears; a previous principal component analysis reduced the number of items to 24, and these were used to compute a single summary factor-based score with each participant receiving a score of one for a correct and zero for an incorrect response (23). Because of problems developing equivalent Spanish translation, analysis was limited to women who completed the questionnaire in English.

We have previously reported that stress and symptoms of depression are not associated with abnormal Pap results (24). We explored the impact of stress and depressive symptoms on colposcopy compliance. Between October 2008 and March 2009, participants completed the Perceived Stress Scale-10 (PSS) (25, 26), which measures individuals' perception of stress and coping; scores on the PSS-10 were converted to tertiles for comparison. At the same visit as the knowledge questionnaire, they also completed the Center for Epidemiologic Studies Depression Scale (CES-D) (27), which measures depressive symptoms; scores on the CES-D above 15 reflect a moderate prevalence of clinical depression (28). In a separate questionnaire administered in 2006, women were asked about aspects of trust in the health care system in general and in their personal health care providers (29). The Wide Range Achievement Test-Version 3 (WRAT) was administered between October 2004 and October 2005 to assess basic academic skills, a relatively stable measure (30).

Single slides for Pap testing were obtained using spatula and brush. These were read centrally according to the 1991 Bethesda system for classification of cervicovaginal cytology, updated in 2001. A study-wide protocol prescribed colposcopy for all women with newly identified genital warts, for new Pap results of atypical squamous cells of undetermined significance (ASC-US) or worse, for surveillance of CIN, and after treatment of CIN. Women were provided nominal compensation for keeping colposcopy appointments. Although sites shared perceived best practices, such as conducting colposcopy in WIHS clinics and using computer systems to identify women with indicated colposcopy for call and recall, specific interventions to maximize colposcopy compliance varied across sites. Women were included in this study if they had an indication for colposcopy identified at the time of questionnaire completion or at the visit six months before or after. Subjects were considered compliant if they completed colposcopy within 12 months of indication.

Demographic and medical variables, Pap results, and colposcopy compliance were tabulated. Colposcopy indications and compliance were assessed using a central registry system. Belief in the preventability of cervical cancer and the importance of Pap testing was assessed independent of overall knowledge score. Compliance with condom use for safe sex was determined by self report of use with all sexual partners. Categorical variables were compared using the Chi-square test and continuous variables were compared using the t-test or Wilcoxon two-sample test. Multivariable logistic regression models were fit to assess factors associated with compliance with colposcopy referral including demographic variables, study site, pap test results, stress and other cognitive variables, knowledge score, HIV serostatus, and consistent condom use.

Results

Of the 1,591 English-speaking women who completed questionnaires between April 1 and October 31, 2007, 347 (22%) had colposcopy indicated for the study period but 21 (1%) were missing responses to some questionnaire items required for calculating a knowledge score, leaving 326 (20%) women for analysis. Of these 326 women with questionnaire data and indicated colposcopy, 222 (68%) were compliant with colposcopy referral and 104 (32%) were noncompliant.

Demographic and other characteristics of these women are shown in Table 1. In bivariate analysis, only study site was significantly associated with compliance. Women from the District of Columbia and the Bronx sites were disproportionately less likely to have indicated colposcopy. Behaviors that adversely affect health, including smoking and drug and alcohol use, were not associated with compliance.

Table 2 shows the effect of women's prior experience with cervical cancer prevention services on colposcopy compliance. In bivariate analysis, women with more abnormal Pap tests, higher grade recent Pap tests, and more prior colposcopic examinations were more likely to comply with recommended colposcopy referral. In multivariable analysis only prior abnormal Pap remained correlated with colposcopy compliance (not shown).

Table 3 shows associations between questionnaire results and colposcopy compliance. The overall mean knowledge score was 12.9 (range 0–24). Compliance was not associated with overall knowledge about cervical cancer prevention or with correct understanding that colposcopy was the proper follow-up for women with abnormal Pap results, even though approximately three-fourths of both compliant and noncompliant women understood these facts. Only about half the women in each group believed cervical cancer could be prevented, but disbelief was not associated with colposcopy noncompliance. Similarly, compliant and noncompliant women did not differ in the importance they ascribed to Pap testing or HPV vaccination.

We explored the impact of noncognitive factors on colposcopy compliance. As shown in Table 4, more than a third of women reported significant stress as reflected by a PSS-10 score over 16, and greater stress was significantly linked to better compliance ($n = 274$). Neither depressive symptoms as measured by CES-D score nor trust in medical providers were associated with compliance.

As shown in Table 5, factors associated with compliance with indicated colposcopy in multivariable analysis included less education, more exposure to the cervical cancer screening process as evidenced by prior abnormal Pap, study site, and greater stress as measured by PSS score ($n = 274$). Knowledge of the cervical cancer screening process, HIV serostatus, unprotected vaginal sex as an indicator of risky health behavior, and ethnicity were not associated with colposcopy compliance. A separate model including only

significant variables did not substantially change results. Site remained a significant correlate of colposcopy compliance even after excluding participants from the site with the lowest compliance rate (data not shown).

Because we provided answers with explanations after participants completed questionnaires, we could not exclude the possibility that this information motivated better subsequent colposcopy compliance, obviating differences. To assess this, we repeated analyses exploring the impact of various factors on colposcopy compliance prior to questionnaire administration. Colposcopy compliance was comparable (67%) in this pre-questionnaire time period and similar factors were found to be associated with colposcopy compliance; including the finding that knowledge was not associated with colposcopy compliance.

Discussion

Designing interventions to improve compliance with colposcopy demands an understanding of determinants of compliance. Health behaviors, like all human behaviors, result from the interaction of cognitive and noncognitive factors. Knowledge may be overridden by cultural or personal beliefs, such that women “know” that scientifically accepted facts about health, such as the link between smoking and cervical cancer, are invalid. Women may discount information from providers they don’t trust, while women who lack knowledge may execute health behaviors they don’t understand when advocated by clinicians they do trust. Stress may modulate health related behaviors, motivating women either to relieve stress through action or inhibiting women from carrying out behaviors they know may improve health. Similarly, debilitating depression may block the execution of healthful behaviors. Not all noncognitive influences on health behaviors can be measured, but our results provide information on which measured factors have impact on colposcopy compliance. This information may influence design of future interventional trials.

We have previously shown that women at high risk for cervical cancer often do not know concepts and practices that are central to cervical cancer prevention (23). Our current results show that this knowledge deficit does not impact colposcopy compliance. Instead, colposcopy compliance is correlated with prior abnormal Pap tests and less education. In high-risk women, experience with the cervical cancer prevention process is more important than site-specific cancer prevention knowledge in determining colposcopy compliance. Less education may lead to improved compliance either through unmeasured linked confounding factors, or it may be because more general education may prompt women to independent but incorrect health care decisions. Stress appeared to motivate women to proceed to colposcopy, and colposcopy compliance may represent an active coping strategy to relieve stress for some women.

Several factors that we had considered potentially important determinants of colposcopy compliance were not significantly associated with compliance. Although many women did not believe cervical cancer is preventable, belief in the preventability of cervical cancer was not linked to compliance, suggesting that other factors are more important. Ethnicity may act as a surrogate for cultural health beliefs but was not associated with compliance. Trust in providers and depression were not significant correlates of compliance after controlling for other factors. Site-specific case management can compensate for the potential negative impact of these. Smoking, drug use, multiple partners, and unprotected sex were not associated with colposcopy compliance, suggesting that determinants of decisions about these personal health behaviors differ from determinants of clinician-prescribed behavior, such as colposcopy.

Study site was the most powerful correlate of compliance in this study. Coker and associates similarly found in a review of women enrolled in the Breast and Cervical Cancer Early Detection Program that state was the strongest predictor of colposcopy compliance and that demographic and health factors were not associated with compliance (31). This suggests that other unmeasured factors are powerful determinants of colposcopy compliance. While we could not analyze individual sites' referral systems in depth, they did differ in method of patient notification, telephone reminders, use of computerized tracking of compliance to stimulate recall, assignment of dedicated colposcopy staff, availability of colposcopy at the same site and preferable on the same day as HIV care. However, our results suggest that optimal practices can override cognitive and noncognitive factors, as some sites were able to bring colposcopy compliance rates above 80%.

Our study was limited by several factors. Our patients were highly motivated participants in a study that had endured for more than a decade, and for women in community settings colposcopy compliance may be driven by different factors. Colposcopy costs were covered by the study, and women were nominally compensated for keeping colposcopy appointments; socioeconomic status and insurance may be more powerful predictors of compliance outside the research setting. Factors we did not measure may contribute to compliance. HIV infected women contributed most of our observations, but our finding that HIV status was not correlated with compliance suggests that our results are generalizable to all high risk women. Our study was limited to English-speaking women, and different factors may drive compliance decisions for immigrant women. Dynamic noncognitive factors, such as knowledge, trust, stress, and depression, may have changed between the time they were measured and the time Pap results returned and colposcopy scheduled. The components of colposcopy scheduling and patient notification and recall after missed visits differed among sites in ways we could not measure; we plan future research to explore site-specific contributing factors.

Our results suggest strictly educational interventions to improve colposcopy compliance are likely to have only marginal impact. O'Gorman and colleagues found women reported improved understanding of colposcopy after receiving educational leaflets but the intervention did not improve compliance. (16). In a study of Latina women, Percac-Lima and associates found that anxiety was a barrier to compliance with colposcopy referral but that difficulty scheduling appointments and communications barriers also obstructed follow-up (32). Diligent notification and recall processes, outreach from peer counselors, arranging for colposcopy in familiar care settings, and other factors integral to care may be more important in improving colposcopy compliance for women at high risk for cervical cancer.

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Table 1

Associations of demographic and medical characteristics of English speaking women who had an indication for colposcopy and who completed questionnaire at baseline with colposcopy compliance (n=326). N (%)

	Compliance with colposcopy		P-value ^I
	Yes N=222	No N=104	
HIV serostatus			
Positive	169 (76.1)	82 (78.9)	0.59
Negative	53 (23.9)	22 (21.2)	
Age at interview (years)			
<30	21 (9.5)	5 (4.8)	0.54
30–39	59 (26.6)	30 (28.9)	
40–49	90 (40.5)	43 (41.4)	
50+	52 (23.4)	26 (25.0)	
Ethnicity			
Non-Hispanic African American	142 (64.0)	59 (56.7)	0.56
Hispanic	36 (16.2)	23 (22.1)	
Non-Hispanic White	31 (14.0)	15 (14.4)	
Other	13 (5.9)	7 (6.7)	
Average household income			
<=\$6,000	51 (23.0)	25 (24.0)	0.60
\$6,001–\$12,000	62 (28.0)	25 (24.0)	
\$12,001–\$18,000	29 (13.1)	10 (9.6)	
\$18,001+	80 (36.0)	44 (42.3)	
Education			
Less than high school	85 (38.3)	29 (27.9)	0.10
Completed high school	67 (30.2)	31 (29.8)	
Some college/ degree	70 (31.5)	44 (42.3)	
Study site			
Bronx, NY	20 (9.0)	28 (26.9)	<0.0001
Brooklyn, NY	57 (25.7)	25 (24.0)	
Washington DC	29 (13.1)	24 (23.1)	
Los Angeles	21 (9.5)	4 (3.9)	
San Francisco	42 (18.9)	10 (9.6)	
Chicago	53 (23.9)	13 (12.5)	
Alcohol use			
Abstainer	129 (58.1)	66 (63.5)	0.42
Light (<3 drinks/wk)	63 (28.4)	29 (27.9)	
Moderate/Heavy (3+ drinks/wk)	30 (13.5)	9 (8.7)	
Current Smoker	109 (49.1)	51 (49.0)	0.99

	Compliance with colposcopy		P-value ¹
	Yes N=222	No N=104	
Injection drug use status			
Current user	7 (3.2)	2 (1.9)	0.38
Former user	58 (26.1)	21 (20.2)	
Never	157 (70.7)	81 (77.9)	
Non-Injection drug use			
Current user	52 (23.4)	25 (24.0)	0.84
Former user	114 (51.4)	50 (48.1)	
Never	56 (25.2)	29 (27.9)	
Male partners in last 6 months			
0	86 (38.7)	36 (34.2)	0.75
1	112 (50.5)	57 (54.8)	
2+	24 (10.8)	11 (10.6)	
Any unprotected sex in last 6 months	63 (28.4)	24 (23.1)	0.31
English WRAT ² score(n=263)			
Median	30.0	32.0	0.22 ³

¹P-value obtained by using the chi-square test unless otherwise specified.

²Wide Range Achievement Test, Version 3

³P-value obtained using the Wilcoxon two-sample test.

Table 2

Pap test results and cervical cancer prevention procedures among cohort by compliance with colposcopy (n=326). N (%)

	Compliance with colposcopy		P-value ¹
	Yes N=222	No N=104	
Total count of abnormal Pap results per patient			
Median	4.0	3.0	0.04 ²
Ever had abnormal Pap result	197 (88.7)	86 (82.7)	0.13
Grade of last Pap result			
Negative	91 (41.0)	61 (58.7)	0.04
ASCUS ³	105 (47.3)	32 (30.8)	
LGSIL ⁴	18 (8.1)	8 (7.7)	
HGSIL ⁵	7 (3.2)	3 (2.9)	
Squamous cancer	1(0.5)	0	
Grade of worst Pap test			
Normal	26 (11.7)	18 (17.3)	0.42
ASCUS	88 (39.6)	45 (43.3)	
LGSIL	84 (37.8)	34 (32.7)	
HGSIL	23 (10.4)	7 (6.7)	
Squamous cancer	1 (0.5)	0	
Total prior WIHS colposcopies per patient			
Median	4.0	2.0	0.0008 ²

¹P-value obtained using the chi-square test unless otherwise specified

²P-value obtained using the Wilcoxon two-sample test.

³Atypical squamous cells of undetermined significance

⁴Low grade squamous intraepithelial lesion

⁵High grade squamous intraepithelial lesion

Table 3

Knowledge and attitudes by compliance with colposcopy

	Compliance with colposcopy		P-value ¹
	Yes N=222	No N=104	
Mean knowledge score (median)	12.9 (14.0)	12.9 (14.0)	0.90 ² , 0.87 ³
After an abnormal Pap test, follow-up may include:			
A blood test	99 (44.6)	43 (41.4)	0.58
A biopsy	169 (76.1)	85 (81.7)	0.26
Another Pap test	160 (72.1)	74 (71.2)	0.86
Colposcopy	162 (73.0)	79 (76.0)	0.57
Testing for HPV	140 (63.1)	70 (67.3)	0.46
Nothing	156 (70.3)	65 (62.5)	0.16
Can cervical cancer be prevented?			
Yes	110 (49.6)	56 (53.9)	0.47
How important is it for women with HIV to have regular Pap tests?			
Extremely or Very important	208 (93.7)	95 (91.4)	0.44
How important is it for women without HIV to have regular Pap tests?			
Extremely or Very important	206 (92.8)	90 (86.5)	0.07
How important do you think the HPV vaccine is for preventing cervical cancer?			
Extremely or Very important	158 (71.2)	73 (70.2)	0.86
How likely would you be to recommend the HPV vaccine to female relatives and friends?			
Extremely or very likely	140 (63.1)	65 (62.5)	0.92

¹P-value obtained by using the chi-square test unless otherwise specified.

²P-value obtained by using the t-test for means.

³P-value obtained using the Wilcoxon two-sample test.

Table 4

Summary of stress, depressive symptom, and trust scores for colposcopy compliance sample

	Compliance		
	Yes	No	p-value
PSS-10 ¹ tertiles (n=274)			
<8	44 (22.9%)	38 (46.3%)	0.0004
8–16	68 (35.4%)	23 (28.1%)	
17	80 (41.7%)	21 (25.6%)	
Depressive symptoms (CES-D ² score \geq 16)	98 (44.3)	37 (35.6)	0.13
“I completely trust my health care provider’s judgment about my medical care.”(n=224)			
Agree/Strongly Agree	159 (85.6)	74 (88.1)	0.57
On a scale from 1 to 10 (not at all-completely), how much do you trust your health care provider? (n=224)			
1–3	2 (1.3)	1 (1.4)	1.0
4–7	29 (19.2)	14 (19.2)	
8–10	120 (79.5)	58 (79.5)	

¹Perceived Stress Scale-10²Center for Epidemiologic Studies Depression Scale

Table 5

Results of logistic regression analysis of factors associated with colposcopy compliance. Odds ratio (95% confidence interval). n = 274

HIV seropositive (vs negative)	0.80 (0.39–1.63)
Knowledge score	1.03 (0.97–1.08)
Any unprotected vaginal sex	0.89 (0.46–1.75)
Nonhispanic African American (vs other)	1.45 (0.75–2.80)
Less than high school education (vs more)	2.24 (1.12–4.51)
Number of prior abnormal Pap tests	1.08 (1.01–1.15)
Site (vs Bronx)	
Brooklyn	4.65 (1.8–11.75)
DC	1.61 (0.61–4.24)
LA	16.1 (2.91–88.6)
San Francisco	8.84 (2.97–26.33)
Chicago	5.32 (2.02–13.99)
PSS score 8–16 (vs <8)	2.90 (1.39–6.05)
PSS score 17 (vs <8)	3.25 (1.45–7.26)