Factors Associated with Time to Colposcopy After Abnormal Pap Testing in HIV-Infected Women

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Abstract

Background: HIV-infected women are at increased risk for cervical dysplasia and require timely follow-up after an abnormal Papanicolaou (Pap) test.

Methods: This retrospective cohort study assessed the proportion of HIV-infected women with colposcopic evaluation after an abnormal Pap test. Time to colposcopy within 12 months after an abnormal Pap test was assessed with univariate and multivariate Cox proportional hazard modeling in a diverse cohort of HIV-infected women between October 1, 2003, and September 30, 2007.

Results: One hundred seventy-seven subjects had an abnormal Pap test: 22 high-grade intraepithelial lesion (HSIL; 12%), 120 low-grade squamous intraepithelial lesion (LSIL; 68%), and 35 atypical squamous cells of undetermined significance, human papillomavirus positive (20%). One hundred twenty (68%) had follow-up colposcopy by 1 year. Decreased time to follow-up was associated with being married (HR 3.5, 95% CI 1.9–6.2), high school graduate or higher education level (HR 1.7, CI 1.2–2.6), HSIL Pap results (HR 2.8, CI 1.3–6.2), Pap testing performed by HIV nurse practitioner versus gynecology clinic (HR 1.7, 1.1–2.7), and CD4 count ≥ 500 cells/mm³ (HR 1.8, CI 1.2–2.8), after adjusting for age, race/ethnicity, and LSIL Pap result. Private insurance was associated with decreased time to colposcopy in unadjusted, but not multivariate analysis. Drug use was not associated with time to follow-up colposcopy.

Conclusions: Almost one third of HIV-infected women did not have a follow-up colposcopy by 12 months after an abnormal Pap test. Since HIV-infected women are at particularly high risk for cervical cancer, these results are unacceptably poor. Identification of the barriers to appropriate follow-up and targeted interventions are necessary to improve timely follow-up for cytologic abnormalities in this high-risk population.

Introduction

CERVICAL DYSPLASIA AND CANCER ARE more common in HIV-infected women compared with the general population.^{1–5} Since detection and treatment of cervical dysplasia has led to decreased rates of invasive cervical cancer, timely follow-up care after an abnormal Papanicolaou (Pap) test is of great importance.^{6,7} HIV-infected women are less likely to have regression of cervical dysplasia, and therefore follow-up after an abnormal Pap test is critical for this group.³

The proportion of women in the general population with appropriate follow-up after an abnormal Pap test varies widely in the literature, ranging from 27% to 90% in two meta-analyses.^{8,9} Generally, between 53% and 75% of women receive appropriate follow-up after an abnormal Pap test.^{10–18} Appropriate follow-up after an abnormal Pap test has been associated with severity of Pap test result in some stud-

ies,^{9,10,16,19,20} but not others.^{11,12,15,17} Other factors that may be associated with adherence to follow-up after an abnormal Pap test include age,^{9,12,13,17,19–21} race,^{9,12,18,19,21,22} and type of insurance.^{11,14,15,17} Education level,^{9,13,19} cigarette smoking,^{9,18} and language spoken^{11,14,17,21} have been assessed previously with mixed results. A prior study showed that proximity to a clinic was not associated with adherence to follow-up after an abnormal Pap test.¹⁴

The literature on follow-up after abnormal Pap testing in HIV-infected women is limited; however, one multi-center study of HIV-infected and high-risk uninfected women published in 1999 showed that inadequate follow-up was associated with HIV infection itself, as well as crack or cocaine use.¹⁵ Among HIV-infected women, adherence to colposcopy was higher in women with health insurance.¹⁵ Since people with HIV are now living longer and healthier lives due to antiretroviral (ARV) therapy, we wanted to examine the

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impact of well-controlled HIV on time to colposcopy. We conducted this retrospective single institution cohort study in order to assess the proportion of HIV-infected women with adequate follow-up after an abnormal Pap test, as well as the factors associated with time to follow-up after an abnormal Pap test. We hypothesized that women with a higher severity of an index Pap result would have shorter time to colposcopy. In addition, we expected that women with well-controlled HIV, as defined by HIV viral load ≤ 75 copies/mL and/or CD4 ≥ 500 cells/mm³, would have shorter time to colposcopy independent of the index Pap result.

Materials and Methods

Boston Medical Center (BMC) is a large, urban safety net hospital with more than 840,000 patient visits and approximately 13,000 Pap tests performed annually. The majority of HIV-infected patients attend the Center for Infectious Diseases (CID), which serves about 1400 HIV-infected patients a year, approximately 40% of whom are female. HIV-infected patients can choose to receive primary care at CID or elect to see a separate primary care provider (PCP). HIV care is also provided at the adolescent center, homeless patient program, and occasionally with non-HIV specialist PCPs.

Since most physicians in CID do not perform Pap tests, a single nurse practitioner (NP) in CID is available to perform Pap tests for all CID patients; this NP coordinates Pap test visits with already scheduled CID visits. Patients may also have Pap testing performed in the gynecology clinic or by a non-CID PCP. The provider performing the Pap test is responsible for reviewing the results and contacting patients with abnormal results for scheduling colposcopy in the gynecology clinic. The Gynecology Coordinator schedules all colposcopy appointments with a goal of colposcopy within 2 weeks for a high-grade squamous intraepithelial lesion (HSIL) Pap result and within 4–6 weeks for a low-grade Pap test result (low-grade squamous intraepithelial lesion [LSIL] or atypical squamous cells of undetermined significance [ASC-US], human papillomavirus positive [HPV+]). Patients with abnormal Pap test results are called by the Gynecology Coordinator to schedule a colposcopy appointment and then sent a confirmatory letter. If a patient cannot be reached, then a letter with information about the abnormal Pap test results and scheduled colposcopy appointment is sent. If an individual misses an initial colposcopy appointment, she receives a phone call and letter. After three missed colposcopy appointments, she is sent a certified letter.

HIV-infected women aged 18 or older were eligible for inclusion if they had an abnormal Pap test between October 1, 2003, and September 30, 2007, in the BMC outpatient electronic medical record. If a woman had multiple abnormal Pap results during the study period, only the initial abnormal Pap test was analyzed. The electronic medical record was reviewed for up to 12 months after an abnormal Pap test. The last HIV visit through at least 1 year of follow-up was noted to ascertain whether a subject continued to be seen for general HIV care.

Abnormal Pap test results were classified by the 2001 Bethesda system as follows: (1) ASC-US HPV+; (2) LSIL; (3) HSIL; (4) atypical squamous cells, cannot exclude HSIL (ASC-H); and (5) atypical glandular cells (AGC).²³ ASC-US HPV+ and LSIL Pap results were considered to be low-grade cyto-

logic abnormalities, while HSIL, ASC-H, and AGC were classified as high-grade cytologic abnormalities. Women with ASC-US HPV negative or HPV not tested were not included in this analysis because these women are generally followed with repeat Pap testing at 12 months per guidelines.²⁴ Women with normal cytology, HPV+ were not included. Specimens diagnosed as LSIL, cannot rule out HSIL, were treated as high-grade cytologic abnormalities. Women were considered to have received adequate follow-up if they had documentation of a colposcopy visit within 6 months of the abnormal Pap result. All pathology results were read by the BMC Pathology Department and women who received gynecologic care outside of the BMC system were not eligible for participation in the study. Pap test provider (HIV NP, gynecologist, or other provider) was noted.

Demographic, socioeconomic, and medical information was abstracted from the electronic medical record. Information on initial HIV viral load, CD4 count after October 1, 2003, and prescription of ARVs was also collected. HIV viral load was assessed as a continuous variable and then divided into a three-level categorical variable based on the distribution of the data: (1) ≤ 75 copies/mL (fully suppressed virus based on our laboratory assay at the time of this study); (2) > 75 to $\leq 10,000$ copies/mL; or (3) $> 10,000$ copies/mL. CD4 count was divided into three clinically appropriate levels: (1) < 200 cells/mm³; (2) 200 to < 500 cells/mm³; or (3) ≥ 500 cells/mm³. Demographic and socioeconomic information included age, race/ethnicity, primary language spoken, country of origin, marital status, education level, employment status, type of insurance, current or former cigarette smoking, or illicit drug use. We controlled for demographic and socioeconomic variables that had either previously been cited as potential predictors of adherence or could plausibly impact follow-up after an abnormal Pap test. For nine subjects (5%) with race/ethnicity listed as "other," race was inferred based on country of birth. Marital status and employment status were included because they may be associated with level of social or economic support or responsibilities that could impact a woman's prioritization of her own health care. Zip code information was used to calculate the distance between the medical center address and center of home zip code as a crude measure of distance from home to medical care. Based on analysis of distance as a continuous variable, it was dichotomized to less than 5 miles (8 km) versus 5 or more miles from the hospital. This study was approved by the Boston University Medical Center Institutional Review Board.

Statistical analysis

The primary outcome, time to follow-up after an abnormal index Pap, was assessed with univariate and multivariate Cox proportional hazards modeling. Because delays in follow-up of more than 6 months can lead to adverse outcomes, subjects were initially censored if they had no evidence of colposcopy by 6 months. As a large minority of women did not have follow-up by 6 months, the hazards analysis was then performed with censoring at 12 months and the results of the two analyses were compared. A graphical check was performed to assess that the proportional hazards assumption was met. Because time to follow-up was not normally distributed, results are presented as medians and interquartile ranges. Variables that were associated with time to follow-up in

univariate modeling, as well as those factors with potential for confounding such as race/ethnicity were assessed for inclusion in the multivariate model. Stepwise forward selection was performed with a cut-off *p* value of <0.1 or evidence of confounding required for inclusion in the final model. All analyses were performed in SAS (version 9.1, SAS Institute, Inc.).

Results

Out of 544 HIV-infected women with at least one Pap test performed between October 1, 2003, and September 30, 2007,

201 (37%) had an abnormal Pap test result and 177 (88%) were eligible for analysis based on ASC-US HPV+ or worse cytology result. Twenty-three subjects with ASC-US HPV negative results and one with ASC-US without HPV testing performed were excluded. Of the 177 women included in this analysis, 155 (88%) had low-grade Pap test results and 22 had high-grade results (12%). The low-grade cytology results included 35 ASC-US HPV+ (20% of total) and 120 LSIL (68%), while the high-grade cytology results consisted of 14 HSIL (8%); two LSIL, cannot rule out HSIL; five ASC-H; and one ACG. The mean age of the subjects was 37.3 years (standard deviation 9.1 years). Seventy-two percent of the subjects were

TABLE 1. CHARACTERISTICS OF STUDY PARTICIPANTS BY COLPOSCOPY STATUS AT 6 MONTHS AFTER PAP RESULT

Variable (n=177) ^a	Colposcopy within 6 months (n=104)	No colposcopy within 6 months (n=73)	p value
Demographic variables			
Age, years			
18–29	21 (20)	15 (21)	0.19
30–39	48 (46)	27 (37)	
40–49	30 (29)	21 (29)	
≥50	5 (5)	10 (14)	
Race/ethnicity			
Black/African	75 (72)	52 (71)	0.94
Hispanic	15 (14)	12 (16)	
White	14 (13)	9 (12)	
English speaker	87 (84)	56 (77)	0.25
U.S. born	43 (41)	33 (45)	0.65
Married	19 (18)	3 (4)	0.005
High school graduate or higher education (n=170)	51 (51)	24 (34)	0.04
Unemployed (n=176)	82 (79)	57 (79)	1.0
Household 5 or more miles from hospital	55 (53)	29 (40)	0.09
Insurance			
Uninsured	34 (33)	21 (29)	0.32
Medicaid	51 (49)	43 (59)	
Medicare	12 (12)	8 (11)	
Private	7 (7)	1 (1)	
Illicit drug use	25 (24)	24 (33)	0.23
Cigarette smoking	36 (35)	23 (32)	0.75
Clinical variables			
Baseline cytology results			
ASC-US HPV+	16 (15)	19 (26)	0.12
LSIL	72 (69)	48 (66)	
HSIL (or other high-grade)	16 (15)	6 (8)	
Location of Pap test			
Gynecology clinic	34 (33)	31 (42)	0.13
HIV NP	50 (48)	24 (33)	
Other provider	20 (19)	18 (25)	
Prescribed ARVs	95 (91)	67 (92)	1.0
HIV viral load (n=175)			
≤75 copies/mL	28 (27)	15 (21)	0.65
>75 to ≤10,000 copies/mL	29 (28)	22 (31)	
>10,000 copies/mL	46 (45)	35 (49)	
CD4 count (n=175)			
≥500 cells/mm ³	32 (31)	12 (17)	0.08
200–<500 cells/mm ³	42 (41)	32 (44)	
<200 cells/mm ³	29 (28)	28 (39)	

Results are presented as *n* (%) unless otherwise noted.

^aASC-US, atypical squamous cells of undetermined significance; HPV+, human papillomavirus positive; LSIL, low-grade squamous intraepithelial lesion; HSIL, high-grade intraepithelial lesion; ARVs, antiretroviral therapy; CD4, CD4 helper suppressor T cells; NP, nurse practitioner.

TABLE 2. TIME TO FOLLOW-UP COLPOSCOPY BY INDEX PAP RESULT

Time to follow-up colposcopy	Pap result ^a			p value
	HSIL (n=22)	LSIL (n=120)	ASC-US HPV+ (n=35)	
Median days to follow-up (Interquartile range)	57 (42–111)	77 (53–206)	104 (55–388)	0.16
Colposcopy within 6 months (59%)	16 (73)	72 (60)	16 (46)	0.12
Colposcopy within 12 months (68%)	19 (86)	83 (69)	18 (51)	0.02
Colposcopy after more than 12 months (12%)	2 (10)	14 (14)	6 (25)	0.33
No colposcopy documented (20%)	1 (5)	23 (19)	11 (31)	<0.05

^aResults are presented as *n* (%) unless noted.

black or of African descent and over half received Medicaid insurance (Table 1). Seventy-six subjects (43%) were born in the United States and 34 subjects were non-English speaking: 16 spoke Haitian Creole, eight Spanish, and the remaining ten spoke a variety of languages. Seventy-four (42%) Pap tests were performed by the HIV NP, 65 (37%) in gynecology, 17 (10%) by an HIV specialist provider, and 21 (12%) by another provider. Based on initial analysis, Pap test provider was collapsed to HIV NP, gynecologist, or other provider. The vast majority of the study participants (92%) were prescribed ARVs, 25% had an HIV viral load ≤ 75 copies/mL, and 25% had a CD4 count ≥ 500 cells/mm³.

For subjects with follow-up, the median time to follow-up was 57 days for HSIL Pap test (interquartile range [IQR] 42–111 days), 77 days for LSIL (IQR 53–206 days), and 104 days for ASC-US HPV+ (IQR 55–388 days) (Table 2). One hundred four (59%) had a follow-up colposcopy within 6 months of an abnormal Pap result; and 120 (68%) had follow-up by 12 months. Twenty-two subjects (12%) had a colposcopy performed more than 1 year after the index abnormal Pap result; ranging from 369 to 1499 days to follow-up colposcopy. Thirty-five subjects (20%) had no colposcopy documented. Twenty-nine of the 35 subjects with no documented colposcopy (83%) had an HIV visit more than 6 months after their index abnormal Pap; and 20 of the 35 (57%) had a repeat Pap test after the index abnormal Pap result (median 370 days to repeat Pap, range 119–1590).

In univariate analyses with censoring after 12 months of follow-up, decreased time to colposcopy was associated with being married, private insurance, HSIL index Pap abnormality (compared to ASC-US HPV+), Pap performed by the HIV NP (compared with gynecology), and CD4 count ≥ 500 cells/mm³ (Table 3). LSIL index Pap result ($p=0.066$), high school graduate or higher level education ($p=0.057$), and household distance 5 or more miles from the hospital ($p=0.077$) trended towards decreased time to colposcopy. There were 160 subjects (90%) with no missing variables of interest who were included in the multivariate modeling. After adjusting for age and race/ethnicity, being married, high school graduate or higher level education, HSIL index Pap result, Pap performed by the HIV NP, and CD4 count ≥ 500 cells/mm³ were associated with decreased time to colposcopy (Table 3). LSIL index Pap result was not associated with decreased time to colposcopy when adjusted for location of Pap test. Removing LSIL Pap result from the model resulted in an underestimation of the association between HSIL and time to colposcopy, and therefore LSIL result was included in the final multivariate model.

TABLE 3. UNIVARIATE AND MULTIVARIATE COX PROPORTIONAL HAZARDS FOR TIME TO FOLLOW-UP AFTER AN ABNORMAL PAP TEST

Variable	Univariate HR (95% CI) ^a	Multivariate HR (95% CI)
Demographic variables		
Age, years		
18–29	Reference	Reference
30–39	1.3 (0.8–2.1)	1.1 (0.6–1.9)
40–49	1.2 (0.7–2.0)	1.1 (0.6–2.1)
≥ 50	0.5 (0.2–1.3)	0.5 (0.2–1.2)
Race/ethnicity		
Black/African	Reference	Reference
Hispanic	0.9 (0.6–1.6)	1.3 (0.7–2.3)
White	1.0 (0.6–1.7)	0.7 (0.4–1.3)
English speaker	1.1 (0.7–1.7)	— ^b
U.S. born	0.7 (0.5–1.1)	—
Married	2.8 (1.7–4.5)	3.5 (1.9–6.2)
High school graduate or higher education level	1.4 (1.0–2.1)	1.7 (1.2–2.6)
Unemployed	0.9 (0.6–1.4)	—
Household 5 or more miles from hospital	1.4 (1.0–2.0)	—
Insurance type		
Uninsured	Reference	Reference
Medicaid	0.9 (0.6–1.3)	—
Medicare	1.0 (0.5–1.8)	—
Private	2.5 (1.1–5.7)	—
Illicit drug use	0.7 (0.5–1.1)	—
Cigarette smoking	1.0 (0.7–1.5)	—
Clinical variables		
Baseline cytology result		
ASC-US HPV+	Reference	Reference
LSIL	1.6 (1.0–2.7)	1.5 (0.8–2.6)
HSIL (or other high-grade)	3.0 (1.5–6.1)	2.8 (1.3–6.2)
Location of Pap test		
Gynecology clinic	Reference	Reference
HIV NP	1.7 (1.1–2.6)	1.7 (1.1–2.7)
Other provider	1.2 (0.7–1.9)	1.1 (0.6–1.9)
Prescribed ARVs	1.2 (0.6–2.3)	—
HIV viral load ≤ 75 copies/mL	1.2 (0.8–1.8)	—
CD4 count ≥ 500 cells/mm ³	1.7 (1.2–2.5)	1.8 (1.2–2.8)

^aResults censored at 12 months of follow-up. HR, hazard ratio; CI, confidence interval. Larger hazard ratios are associated with faster time to follow-up.

^bDenotes variable assessed, but not included in the final model.

Discussion

Our study showed that only 59% of HIV-infected women in this diverse, urban cohort had a colposcopy by 6 months, and only 68% had a colposcopy by 1 year after an ASC-US HPV + or worse cytology result. These findings are similar to those previously published in the general population at BMC and associated community health centers,^{11,17} and in an HIV-infected or high risk for HIV cohort,¹⁵ which ranged between 62%–65% at 6–7 months after an abnormal Pap result. Higher grade of index Pap abnormality was associated with decreased time to follow-up. As HSIL Pap tests are more likely to be associated with high-grade dysplasia compared with low-grade Pap results,²⁴ it is reassuring that these findings are being dealt with more quickly; however, 14% of women with high-grade Pap results and more than one third of women with low-grade Pap results had still not received a colposcopy by 1 year after the index abnormal Pap result. Since the guidelines for the management of abnormal Pap testing recommend colposcopy after an ASC-US HPV +, LSIL, or HSIL Pap result for nonadolescent women regardless of HIV status,²⁴ these results are unacceptable.

Women with the index Pap test performed by the NP in the HIV clinic had a faster time to follow-up compared with women seen in the gynecology clinic. There was no difference between time to follow-up for an index Pap performed in gynecology clinic compared with other providers. It is surprising that there would be a longer time to colposcopy for individuals with a Pap test in gynecology clinic because all colposcopies are performed in the gynecology clinic and therefore individuals already seen in that location may have an easier time coming back for follow-up. The HIV NP has a long-standing relationship with many of the patients she sees for gynecologic care, which may facilitate arranging follow-up when needed. It seems more likely that women seen in the gynecology clinic are seen there because of previous abnormalities or other active gynecology issues. It may be that women with prior abnormalities may be less inclined to follow-up quickly for what is perceived as a chronic problem, or gynecologists may be more likely to delay or defer colposcopy for someone who has had one or more prior colposcopies or has another active gynecologic issue or pregnancy. This may be why HSIL, but not LSIL Pap results remained significantly associated with decreased time to follow-up after adjusting for Pap provider. We did not have access to the medical record prior to the index Pap result to ascertain prior dysplasia or Pap abnormalities, which limits our ability to examine this issue in greater detail.

We found an association between CD4 count ≥ 500 cells/mm³ and decreased time to follow-up after an abnormal Pap result. It may be that women with a higher CD4 count are more adherent with their medical care in general. Women with a higher CD4 count may also have fewer other competing medical or social issues that impact their ability to prioritize follow-up gynecologic care. A prior study in this population found that lower CD4 count is associated with decreased adherence to routine Pap testing²⁵; therefore, it makes sense that women who are more likely to have a Pap test would also be more likely to follow-up if that Pap result is abnormal. In our review of the literature, we found only one other study that focused primarily on adherence to follow-up colposcopy after an abnormal Pap test in HIV-infected

women.¹⁵ That study was conducted in the mid-1990s when ARVs were not as frequently prescribed, and only 35% of that study population was prescribed ARVs compared to over 90% in our study. CD4 count was not associated with colposcopy by 6 months in that study; however, a smaller proportion of women in that population had a high CD4 count. Additionally, viral load ≤ 4000 copies/mL was associated with decreased adherence and viral load >4000 to 50,000 trended towards an association with decreased adherence compared with viral load $>50,000$ copies/mL in that study. There was no association between viral load and time to colposcopy in our study. Only about 68% of subjects had a reported viral load in the Cejtin et al. study,¹⁵ and about 23% of those individuals had a viral load less than 4000 copies/mL, while about 24% of our entire cohort had a fully suppressed viral load of ≤ 75 copies/mL.

We compared the multivariate models using censoring at 6 and 12 months of follow-up and ultimately chose 12 months of follow-up to incorporate individuals who had greater delays before follow-up colposcopy and to increase the number of uncensored observations. Overall, the two models were similar, except that English-speaking status trended towards decreased time to follow-up in the multivariate model at 6, but not 12 months.

While other studies have suggested a relationship between younger age and decreased likelihood of adherence with follow-up after abnormal Pap testing,^{13,17,21} we did not find this association in HIV-infected women. It may be that young HIV-infected women are more concerned about abnormal Pap results due to their comorbidity or that providers are more likely to advocate for colposcopy in younger HIV-infected women. While our study showed that married women had decreased time to follow-up after an abnormal Pap test, the reason for this association is unclear. It could be that being married is a marker for increased social support. Married women may also have an additional source of income and therefore have more flexibility to attend to their own health-care needs. In addition, high school graduate or higher education level was associated with decreased time to follow-up colposcopy; this association has been variable in other studies.^{8,9,15,16,19} Women with a higher education level may prioritize dealing with a perceived health problem; however, education level may also be a marker for income or another social factor. The role of social supports in follow-up after an abnormal Pap test needs further exploration.

Having private insurance compared with no insurance was associated with faster time to colposcopy in the univariate, but not multivariate model. Since only 5% of the subjects in this socioeconomically disadvantaged cohort had private insurance, the significance of this association is unclear. Other studies at BMC,^{11,17} as well as at other locales^{14,15} have shown an association between insurance status and appropriate follow-up, so it is unclear if the lack of association in our multivariate model is related to the limited number of women with private insurance in this cohort or other factors. Farther distance from the hospital trended towards an association with decreased time to follow-up in univariate, but not multivariate modeling. It is likely that distance from the hospital is a marker of socioeconomic status.

Our study utilized an in-depth dataset obtained directly from the medical records of a diverse cohort of women, which included both demographic and medical variables. Almost

20% of the women in our cohort did not have a colposcopy documented at any point during the follow-up period. Although women who went elsewhere for follow-up colposcopy could have been inappropriately classified as having no follow-up testing due to the retrospective nature of this study, this seems unlikely because all but six women with no colposcopy had an HIV provider visit more than 6 months after the abnormal Pap result. In addition, 57% of those women had a repeat Pap test documented before the end of study follow-up, which suggests that they were not receiving gynecologic care outside our institution. We had access to colposcopy appointment history (including missed appointments), but we were unable to ascertain how quickly the women were contacted about their abnormal Pap test and how well they understood this result. These issues are likely to be very important in assessing time to follow-up after an abnormal Pap test. It is likely that there were variations in provider practice in contacting patients and scheduling follow-up after an abnormal Pap result. These differences cannot be assessed fully due to the retrospective nature of this study. In addition, we defined adequate follow-up after an abnormal Pap test as having a colposcopy and did not assess how many women missed follow-up treatment appointments after colposcopy was performed.

Conclusions

Almost one third of HIV-infected women did not have a follow-up colposcopy by 12 months after an abnormal Pap test. Since HIV-infected women are at particularly high risk for cervical cancer, these results are unacceptably poor. While our study was conducted at a safety net hospital, HIV is a disease that disproportionately affects minority and socio-economically disadvantaged populations, therefore we believe these findings have potential relevance for many locations that provide HIV care to a large number of women. Further studies on barriers to care and the role of social supports are needed in order to develop interventions to improve rates of follow-up after abnormal Pap testing in HIV-infected women.

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Author Disclosure

The authors have no conflicts of interest to report.

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