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Timeliness and follow-up patterns of cervical cancer detection in a cohort of medically underserved California women

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Abstract

Introduction—This study examines factors associated with timely follow-up after Pap test in a program providing cervical cancer detection services to medically underserved California women.

Methods—Data between 01 January 1992 and 30 June 2007 were analyzed. Cox proportional hazard regression was used to identify subgroups of women with delayed time to diagnosis or treatment scheduling. The probability of being scheduled for final diagnosis and treatment was assessed using logistic regression analysis. Demographic and clinical characteristics of the women lost to follow up were examined.

Results—Time from screening to final diagnosis scheduling differed according to age group, race/ethnicity, and Pap test result. Race/ethnicity and age were associated with whether treatment was scheduled or not. While loss to follow up among those scheduled for final diagnosis was associated with certain patients' characteristics, no such association was found among those who were scheduled for treatment.

Conclusions—Patient's demographic characteristics determine the odds of being scheduled for final diagnosis and treatment as well as timeliness of follow-up from screening to final diagnosis. Findings suggest that the dual goal of reducing health disparities and cost-effective detection and treatment of precancerous disease to prevent cervical cancers cannot be achieved without consideration of racial/ethnic differences and needs.

Keywords

Cervical cancer; Follow-up; Abnormal results; Pap test; Medically underserved

Introduction

Cervical cancer was one of the most prevalent causes of cancer death among American women in the past [1]. However, between 1955 and 1992, the number of cervical cancer deaths in the United States dropped by 74% [1]. The main reason for this major phenomenon is the increased use of regular cervical cytology (Pap) tests [2–4]. This screening procedure can detect premalignant changes in the cervix before cancer develops. Application of regular cervical cancer screening programs to communities of women leads to cancer prevention through the detection and treatment of premalignant changes, and early detection of cancer when it is still in its most curable stage.

Pap test programs can only be effective if abnormal results are followed by timely diagnosis and management. One of the original goals behind the creation of the Bethesda System was to create a uniform terminology that would provide clear guidance for these diagnosis and management steps [5]. Bethesda System terms, therefore, serve as the trigger for follow-up and are linked to uniform management strategies through the American Society of Cervical and Colposcopic Pathology's consensus guidelines in order to better assure timely detection and treatment [6]. However, not all women receive the timely follow-up that they require [7]. Marcus and Crane published an extensive review of many cervical cancer detection programs and found that the lost to follow up rate was in the 30–50% range [8]. In a recent study of the California's Cancer Detection Programs: Every Woman Counts (*CDP: EWC*), we noted a lost to follow up rate of 23.7%. Among those with Pap test abnormalities that did receive follow-up, the time interval from Pap test to final diagnosis varied from 26 to 121 days. The average interval increased with the severity of the abnormality and was longest for cancer results [9].

Compliance with follow-up recommendations is most likely a multifactorial problem. Fox et al. [10] found that the importance of Pap test screening is not fully appreciated by many women and that response to an abnormal Pap test result and compliance with follow-up recommendations vary among women of different age, race, ethnicity, etc. *CDP: EWC* offers a unique opportunity to evaluate these issues in a medically underserved minority population. This study examined the timeliness of scheduling for final diagnosis and initiation of treatment that followed Pap test screening. It also assessed the probability of follow-up status for final diagnosis and treatment initiation in dependency on certain characteristics of women enrolled in *CDP: EWC*. The study specifically examined lost to follow-up patterns of completion of diagnostic work-up and initiation of treatment after cytologic screening.

Materials and methods

Data source

Data for this study were obtained from *CDP: EWC* for the time period between 01 January 1992 and 30 June 2007. *CDP: EWC* provides free Pap test exams and, if needed, cervical diagnostic services to women who are low income, uninsured, or underinsured. Implementation of the program is through funding from the National Breast and Cervical Cancer Early Detection Program and California State tobacco taxes and is supported by the Breast and Cervical Cancer Mortality Prevention Act of 1990. In 1999, California Proposition 99 tobacco tax revenues were allocated to *CDP: EWC*, and from July 2006 to

present, these tax revenues paid for part of the cervical cancer screening services of this program. Primary care providers provide and coordinate screening and referral to diagnostic and treatment services, enroll program eligible women via web-based application, and submit data to *CDP: EWC*.

Study subjects

The data consisted of 458,854 screening cycles (from screening Pap test, including the resolution of an abnormal finding, to the initiation of treatment for cervical cancer). Each cycle started with a Pap test through *CDP: EWC* between 01 January 1992 and 30 June 2007. These 458,854 cycles were observed for 281,856 women, 67.57% of whom had exactly one screening cycle while the remaining 32.43% had multiple screening cycles. Preliminary inclusion criteria for screening cycles in this study consisted of: (1) women aged 25 or older; (2) initial Pap test between 01 January 1992 and 31 December 2006; (3) recorded Pap test results. There were 785 (0.17%) screening cycles with more than 365 days between screening and final diagnosis with high likelihood of recording errors in the final diagnosis status. Since these cycles constituted a very small portion of the 458,854 cycles and since by including them in the analysis, the significance of results did not change, we chose to exclude them from our analyses. There were 408,014 cycles that satisfied these criteria, observed for 253,170 women. To avoid statistical dependency in the response variable, the last cycle for each woman was used in the analysis. A cutoff date of 31 December 2006 was chosen to avoid lingering effects of reporting delays. All screenings that were performed before the cutoff date were expected to have complete diagnostic and treatment information.

Data analysis

Survival analyses—The main outcomes of interest for survival analyses were: (1) time from screening to the time at which final diagnosis was scheduled (final diagnostic work-up planned for cervical dysplasia or cancer) and (2) time from “final diagnosis scheduled” to the time that treatment initiation was scheduled. Of the 253,170 study participants, 4,843 were scheduled for final diagnosis, based on the abnormality seen in their cytologic and pelvic screening. Uncensored observations of time from screening to “final diagnosis scheduled” were obtained for 4,029 women, whose schedule for final diagnosis was set before the cutoff date of 31 December 2006. Observed event time was recorded as the number of days between screening date and the “final diagnosis scheduled” date. Time from screening to the “final diagnosis scheduled” date was censored when the schedule was pending (278 women), patient was lost to follow up (322 women), or if it occurred after the cutoff date (214 women). For censored events, censoring times were defined as follows: when “final diagnosis scheduled” was pending or scheduled after the cutoff date, it was the time between screening date and the cutoff date; when loss to follow up occurred, it was the time period between screening date and the loss to follow up date. Altogether, censored and uncensored event times were recorded for 4,843 women in the study.

Time from “final diagnosis scheduled” (work-up planned for final diagnosis) to “initial treatment scheduled” (patient scheduled for initiation of treatment) was defined similarly. Uncensored observations of time from “final diagnosis scheduled” to “initial treatment scheduled” were observed for 919 women, whose schedule for initiation of treatment was before the cutoff date. Observed event time was recorded as the number of days between “final diagnosis scheduled” and “initial treatment scheduled”. “Initial treatment scheduled” was censored in the following situations: treatment initiation was pending to be scheduled (53 women); patient was lost to follow up (62 women); “treatment” began after the cutoff date (6 women). Similar definitions as for the censoring events of time from screening to scheduled final diagnosis were used for the time from “final diagnosis scheduled” to “initial

treatment scheduled”. Altogether, censoring times and times to event were available for 1,003 study participants.

We used Cox proportional hazard regression models to examine the effects of participants’ characteristics on time from screening to “final diagnosis scheduled” and time from “final diagnosis scheduled” to “treatment initiation scheduled”. The hazard ratio then corresponds to the immediacy of being scheduled for final diagnosis (final diagnosis work-up planned) or for initiation of treatment scheduled in comparison with the baseline. Higher hazard ratios are better in this study, as they correspond to increased immediacy and thus faster scheduling for final diagnosis or treatment initiation. Validity of the proportional hazards assumption was checked graphically. Mild violation seemed to occur for time from “final diagnosis scheduled” to “treatment initiation scheduled” analysis. Stratification would then present an alternative option. However, a disadvantage of using stratified Cox regression models is that no estimation and inference can be obtained for the effects of the stratifying variable. As a result, stratification is primarily suitable for nuisance variables whose effects are of little or no intrinsic interest. In this study, however, the effects of all predictors were relevant for our analysis, and therefore in the end, the unstratified Cox model was used. Results for time to “scheduled treatment initiation” need to be interpreted cautiously, due to the possible violation of the proportional hazards assumption.

Categorical data analysis—Logistic regression analysis was used to examine factors that might determine whether a final diagnosis or treatment initiation was scheduled or not. The outcome “final diagnosis scheduled” was based on the final diagnostic work-up planned for cervical dysplasia or cancer. The levels were defined as “yes” when diagnostic work-up was planned on the basis of abnormal Pap test or pelvic exam, and “no” when diagnostic work-up was not planned, or the diagnostic work-up plan was not determined yet. Similarly, the outcome of “treatment initiation scheduled” was defined as “yes” and “no.” The scheduling for treatment initiation was separately analyzed for those with *Abnormal* Pap test results and those with *Minor Abnormal* Pap test results.

To assess significance of factors associated with the outcome of “final diagnosis” status (work-up complete, work-up pending, and lost to follow up), among the 4,843 patients who were scheduled for final diagnosis, we performed chi-squared tests for each of the predictors with and without those with “work-up pending” status. Similarly, we performed two sets of chi-squared tests for each of the predictors, one with and the other without the “work-up pending” group, to determine the effect of the predictors on the status of treatment (started, pending, and lost to follow up) among the 1,003 patients who were scheduled for initiation of treatment.

Predictors—Predictors were age group, race/ethnicity, history of Pap test screening, result of Pap test, existence of previous screening cycle, the abnormality of previous to the last screening cycle, and the result of the final diagnosis. This last predictor was used for the analysis of time from “final diagnosis scheduled” to “treatment initiation scheduled”. Dummy variables were created for categorical predictors, and a reference group (baseline) was established. Age was grouped into three categories: 25–39, 40–49 and 50, and older, where the last category was chosen as the reference group. Race/ethnicity was classified into six categories based on a combination of race and Hispanic origin: (1) *White*: Caucasians, not of Hispanic origin; (2) *Black*: African American, not of Hispanic origin; (3) *Asian*: Asian or Pacific Islander or Hawaiian, not of Hispanic origin; (4) *Native American*: Native American including American Indian and Alaskan native, not of Hispanic origin; (5) *Hispanic*: of Hispanic origin; and (6) *unknown*. *White* was the reference group. History of prior Pap test could be yes, no, or unknown. The group with no previous Pap test was the reference group. The results of Pap test were classified into four categories: (1) *Abnormal*,

defined as “atypical squamous cells for which high-grade squamous intraepithelial lesion (SIL) cannot be excluded (ASC-H),” “high-grade SIL (with features suspicious for invasion),” “squamous cell carcinoma, or abnormal glandular cells (including atypical, endocervical adenocarcinoma in situ and adenocarcinoma),” “results unknown, presumably abnormal, Pap test from a non-program funded source”; (2) *Minor abnormal*, defined as “atypical squamous cells of undetermined significance (ASCUS),” “low-grade SIL (including human papillomavirus changes)”; (3) *Unsatisfactory*, defined as “unsatisfactory Pap test,” “Pap test needed but not performed at this visit (including refused),” “infection/inflammation/reactive changes,” “results pending,” or “other”; (4) *Negative*, defined as “negative within normal limits,” “not needed,” “negative for intraepithelial lesion or malignancy”. *Negative* was the reference group. A dummy variable indicating whether a woman had previous screening cycles with *CDP: EWC* was included. The reference group was not having a previous screening cycle. A second dummy variable indicated whether the previous to the last screening cycle had an abnormal result. No abnormality in the previous to the last screening cycle was the reference group. The results of final diagnosis were classified as follows: (1) *Normal* if the final diagnosis was normal, benign reaction or inflammation; (2) *Mild Abnormal* if the final diagnosis was HPV or atypical condylomata, mild dysplasia, cervical intraepithelial neoplasia grade I (CINI), or low-grade SIL (biopsy diagnosis); (3) *Moderate or severe Abnormal* if the final diagnosis was moderate dysplasia, severe dysplasia or carcinoma in situ, CIN II or III (CINII, CINIII), or high-grade SIL (biopsy diagnosis); (4) *Cancer* when the final diagnosis was invasive cervical carcinoma, and (5) *Other*. These final diagnosis results were used as predictors in the analysis of time from diagnosis to treatment. *Cancer* was the reference group.

For all of the analyses, the significance of unadjusted effects of all predictors was first evaluated, then a set of covariates was selected based on stepwise variable selection as implemented in SAS version 9.13 Proc Phreg and Proc Logistic (SAS Institute Inc. Cary, NC, 2007).

Results

Characteristics of the participants

Table 1 presents the distributions of predictors for the entire study population ($n = 253,170$), those who were scheduled for a final diagnosis ($n = 4,843$), and those who were scheduled for initiation of treatment ($n = 1,003$). Table 2 presents the distributions of predictors among those who had been scheduled for a final diagnosis with completed final diagnostic work-up ($n = 4,243$), work-up pending ($n = 278$), and lost to follow up ($n = 322$) status. Table 3 presents the distribution of predictors among those who had been scheduled for treatment with initiated treatment ($n = 922$), treatment pending ($n = 19$), and lost to follow up ($n = 62$) status. Women of 50 years of age or older constituted the largest subgroup in all clinical cycle spectrums, specifically among: (1) the entire study population, (2) those scheduled for a final diagnosis, (3) those who completed final diagnostic work-up, (4) those who were scheduled for treatment initiation, and (5) those with initiated or pending treatment. Distributions in all the three tables indicate that being Latina, having a history of a prior Pap test (although not necessarily through *CDP: EWC*), not having a previous screening cycle with the *CDP: EWC*, and not having an abnormality in the previous to the last screening cycle are the most prevailing characteristics. About 92% (232,023) of the study population's Pap test results were categorized as *Negative*, and about 53% (2,236) of those with completed final diagnostic work-up had normal final diagnosis results. About 2% ($n = 16$) of those who were later scheduled for treatment had a Pap test categorized as *Unsatisfactory*, and about 3% ($n = 26$) had a *Negative* Pap test result. Diagnostic and treatment follow-up among study participants was based on Pap test and pelvic exam. Of those with completed diagnostic work-up, about 23% ($n = 993$) had *Mild* and 18% ($n = 781$) had *Moderate* or

Severe abnormality. About 2% ($n = 101$) had cancer. Results of the final diagnosis for those with initiated treatment were: Moderate or Severe abnormality ($n = 678$; about 74%), Mild abnormality ($n = 115$; about 13%), Cancer ($n = 92$; about 10%), and Other ($n = 37$; about 4%). Of those who were already scheduled for final diagnosis, about 7%, and among those who were scheduled for initiation of treatment, about 6% were lost to follow up.

Time from screening to final diagnosis schedule

Table 4 shows the Cox proportional hazard regression model for the time that elapsed between screening and scheduling a final diagnosis ($n = 4,843$). Women who were in the youngest age group (25–39 years) were found to have the shortest time to be scheduled (Hazard Ratio (HR) = 1.28; $P < 0.0001$). Women with race/ethnicity other than White, especially Native Americans (HR = 0.60; $P = 0.01$) and Latinas (HR = 0.65; $P < 0.0001$), and those who had *Abnormal* (HR = 0.77; $P < 0.0001$), or *Minor Abnormal* (HR = 0.71; $P < 0.0001$) Pap test results had longer waiting times until being scheduled for final diagnosis.

Time from final diagnosis schedule to treatment initiation schedule

The Cox proportional hazard regression analysis of data on 1,003 women, who were scheduled for treatment, showed no statistically significant individual factors (results not shown). The only borderline statistical significance was for the Asian group with a hazard ratio of 0.73 (P -value = .0703), suggesting a possibly longer time for this group until they were scheduled for treatment.

Odds of being scheduled for final diagnosis

The only factor associated with being scheduled for final diagnosis was the result of the Pap test, with all *Abnormal*, *Minor Abnormal*, and *Unsatisfactory* results being significantly different than the *Negative* results. A patient's demographic characteristics or clinical history had no effect on being scheduled for final diagnosis (results not shown).

Odds of being scheduled for treatment

We examined the odds of being scheduled for treatment among two groups: (1) those with *Abnormal* Pap test result (1,959 women) and 2) those with *Minor Abnormal* Pap test result (7,604 women).

Women with *Minor Abnormal* Pap test result would normally not be scheduled for cancer treatment, but follow-up with an abnormal pelvic exam and further subsequent diagnostic results could indicate abnormality, and in addition, treatment could be scheduled for Candida and sexually transmitted diseases.

The logistic regression analysis results given in Table 5 indicate that age and race/ethnicities were significant factors for the odds of being scheduled for treatment in both groups. Presence of the abnormality of previous to the last screening cycle was a significant factor in the group with *Abnormal* Pap test results. The odds of being scheduled for treatment for women in the age group of 25–39 were more than two times in the *Abnormal* Pap test group and more than three times in the *Minor Abnormal* group compared to baseline for women 50 years or older. In both *Abnormal* and *Minor Abnormal Pap test groups*, the odds of being scheduled for treatment for Hispanic, Asian, and Black women were significantly lower than for Whites.

Lost to follow up

The chi-squared tests in Table 2 indicate that among those scheduled for final diagnosis, in addition to the patient's clinical characteristics, the status of the final diagnosis is associated

with patient demographics, regardless of whether one includes or excludes the group with pending work-up plan. When the characteristics of women lost to follow up are compared to those with completed final diagnostic (the group with definite status), Blacks (17.86%) followed by Native Americans (15.00%), those with no history of prior Pap test (11.54%), those with *Abnormal* Pap test results, (16.15%), those with no previous screening cycles (8.18%), and finally those with abnormality in the previous to the last screening cycle (11.90%) had the highest percentage of loss to follow up.

The status of treatment among those scheduled for treatment initiation was not associated with patient demographics or clinical characteristics, based on the results of chi-squared tests for each of the predictors regardless of including or excluding the “work-up pending” group from the tests (Table 3).

Discussion

This study shows that the Pap test result is not the only factor influencing the timeliness of follow-up for being scheduled for final diagnosis or of treatment initiation in this cohort of medically underserved California women participating in *CDP: EWC*. We found that patient demographic characteristics are significant indicators determining odds of being scheduled for treatment and timeliness of follow-up from screening to final diagnosis. For older women and women of color, it took longer to be scheduled for final diagnostic follow-up services. Among women with *Abnormal* and *Minor Abnormal* Pap test results, we found significantly lower odds of being scheduled for treatment among those who were Hispanic, Asian, and Black, compared to those of White women. Additionally, loss to follow up for completion of the final diagnostic work-up was more prevalent among Blacks and Native Americans. These findings can have important implications for addressing health disparities and in the development of effective screening programs for medically underserved populations. The results of this study are in agreement with other studies that examined the impact of sociodemographic characteristics such as race/ethnicity, age, and income as determinants of late stage diagnosis of cervical cancer and slower follow-up for women with *Abnormal* Pap test results [7, 10–14]. Mandelblatt et al., while controlling for the effects of social class and health care setting, quantified the individual and combined effects of age, race, socioeconomic class, and type of health care setting on the cervical cancer stage at diagnosis. They found elderly, Black, and lower socioeconomic status women who use public hospitals at much higher risk of a late stage diagnosis. Carey and Gjerdingen found that southeast Asian women are less likely than White and Black women to comply with recommended cervical disease follow-up diagnostic and treatment procedures.

Although abnormality of previous to the last screening cycle in this study was significant in the group with *Abnormal* Pap test results when examining the odds of being scheduled for treatment, neither previous history of screening nor a history of a previous abnormality was found to be a predictor for the timeliness of the diagnosis. One might have assumed that those previously motivated to have a Pap test and women who had a previous abnormality might be more motivated to schedule follow-up and treatment, but this appears not to be the case. Fox et al. [10], who analyzed data from the same population of medically underserved California women, suggest that the assumption that women will follow through on their own to obtain follow-up diagnostic tests and treatment after an abnormal Pap test finding is not always realistic. They concluded that women of color, older women, and women with less severe diagnoses should receive support to improve adherence to recommended follow-up procedures. Hiatt et al. [15] examined three community-based cancer screening and follow-up interventions for underserved women, and emphasized the importance of targeted interventions to persons of foreign origin, particularly for those less acculturated. Zapka et al. [16] recommended that patients need clear communication and follow-up

recommendations, especially when the findings are equivocal and in health care settings where multiple providers are involved in the clinical decision process.

Patient-level interventions such as mail and telephone reminders, telephone counseling, and print educational interventions have been shown to be effective in increasing follow-up rates. However, interventions to improve follow-up abnormal findings in cancer screening require a multi-faceted approach that must be informed of provider-, practice-, and policy-level correlates of follow-up as described by Bastani et al. [17] in their extensive review of literature on intervention studies on improving follow-up of abnormal cancer screening findings. They note that the majority of intervention studies have focused on patient-level factors and there is insufficient information on effectiveness of provider-, practice-, or policy-level interventions to increase timely follow-up of abnormal cancer screening findings. In Marcus and Crane's extensive review of previous cervical cancer detection programs, they found that "tickler" files, educational pamphlets, motivational mailings accompanying notification of abnormal results, telephone counseling, and transportation incentives are all effective, either alone or in combination to improve follow-up [8]. Yabroff et al. [7] also reviewed the literature on loss to follow up in cancer screening programs, including programs for screening cervical cancer. They found that patient factors such as a "fatalistic" attitude, fear of pain, concerns about femininity, perception of the provider as a trustworthy information source, and the perception that the provider understood a woman's needs all influenced follow-up. Patient reminders and referral to an enhanced clinic providing patient navigators and peer-counselors improved follow-up [7]. These authors also recommended improvements of data infrastructure and use of conceptual models by researchers to achieve satisfactory intervention development aiming at cancer control [7].

Low-income Hispanic women have the highest rate of cervical cancer in the country, but well-designed screening and follow-up programs often yield only modest improvements [15]. Language has been shown to have a significant effect on the success of cervical cancer screening programs [15, 18]. In addition, differences in family support among different ethnic groups, access to public transportation in different communities, and cultural biases regarding medical care can all affect follow-up for ethnic and racial minorities. Provider-based barriers have rarely been addressed, but could potentially be a significant contributing factor. These could include conscious or unconscious biases regarding different racial or ethnic groups, and adherence of individual providers to established follow-up and treatment protocols [7]. Age-specific interventions may also be needed. Loss to follow up among those scheduled for final diagnosis in this study was more prevalent among the 40–49 age group. Transportation needs, educational approaches, and issues related to family support may vary and require specifically adapted types of intervention.

We also found that significant delays in scheduling for final diagnosis occur for women with "minor abnormal" results; however, this is not necessarily unexpected. During much of this study period, the standard follow-up guidelines for some of the Pap test results included in this category, most notably, ASCUS did not require definitive diagnostic procedures such as colposcopy, like those in the "Abnormal" category. The 2001 consensus guidelines from the American Society of Cervical and Colposcopic Pathology (ASCCP) included a program of two repeat Pap tests at 6-month intervals, though colposcopy and HPV testing for high-risk types were also included as possibilities for follow-up and management [5, 6]. The two-Pap tests follow-up strategy was most often used, since the probability of a high-grade cancer precursor is considered low in ASCUS Pap tests, and due to the higher expense of the other follow-up options. The 2–6-month intervals of the two-Pap tests follow-up strategy not only created an inherent delay in diagnosis, but also it was more likely to be associated with poorer compliance and more "drop outs", since women were likely to lose interest in the follow-up. By 2006, when the next consensus conference took place, liquid-based Pap

testing was more prevalent and could facilitate HPV testing, eliminating follow-up visits for a large percentage of women, improving compliance, and speeding diagnosis. Future analysis of the data associated with this program may, therefore, show fewer delays to diagnosis in this “minor abnormal” category.

It is notable that the majority of abnormalities detected in this screening population are “high-grade” lesions –CIN II-III/CIS. Additionally, due to sheer volume of patients, one may expect that many of the CINII/III cases are diagnosed with antecedent lower-grade abnormalities. These are the precancerous changes most likely to advance to invasive cancers and represent the lesions targeted for detection through cervical cancer screening programs. These findings indicate that medically underserved women participating in *CDP: EWC* are truly a high-risk population worthy of special attention and efforts to develop effective strategies that will minimize loss to follow up or delays can lead to enormous benefits in cancer prevention. A “one size fits all” follow-up model will neither be effective nor appropriate. The dual goal of reducing health disparities and to implement cost-effective detection and treatment of precancerous disease to prevent cervical cancers cannot be achieved without consideration of racial and ethnic differences and needs.

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Table 1

Demographic and clinical characteristics of the study population

Characteristics	All participants (<i>n</i> = 253,170) <i>n</i> (%)	Those scheduled for final diagnosis ^b (<i>n</i> = 4,843) <i>n</i> (%)	Those scheduled for treatment initiation (<i>n</i> = 1,003) <i>n</i> (%)
Age			
25–39	47,090(18.60)	1,391(28.72)	353(35.19)
40–49	83,907(33.14)	1,662(34.32)	305(30.41)
50+	122,173(48.26)	1,790(36.96)	345(34.40)
Race/ethnicity			
White	23,190(9.16)	590(12.18)	158(15.75)
Black	7,557(2.98)	142(2.93)	35(3.49)
Asian	21,310(8.42)	290(5.99)	48(4.79)
Native American	3,107(1.23)	40(0.83)	14(1.40)
Hispanic	152,860(60.38)	3,022(62.40)	602(60.02)
Unknown	45,146(17.83)	759(15.67)	146(14.56)
History of prior Pap test			
Yes	202,254(79.89)	3910(80.74)	782(77.97)
No	16,520(6.53)	245(5.06)	66(6.58)
Unknown	34,396(13.59)	688(14.21)	155(15.45)
Result of Pap test			
Abnormal	1,959(0.77)	1,525(31.49)	665(66.20)
Minor abnormal	7,604(3.00)	2,497(51.56)	296(29.51)
Unsatisfactory	11,584(4.58)	226(4.67)	16(1.60)
Negative	232,023(91.65)	595(12.29)	26(2.59)
Previous screening cycle			
Yes	79,484(31.40)	1,467(30.29)	225(22.43)
No	173,686(68.60)	3,376(69.71)	778(77.57)
Abnormality of previous to the last screening cycle			
Yes	435(0.17)	89(1.84)	29(2.89)
No	252,735(99.83)	4,754(98.16)	974(97.11)
Result of diagnosis ^a			
Normal			0(0.00)
Mild			128(12.76)
Moderate or severe			735(73.28)
Cancer			96(9.57)
Other			44(4.39)

^aResults of diagnosis for the 1,003 patients who were scheduled for treatment initiation^bDiagnostic work-up scheduled (final diagnosis scheduled) on the basis of abnormal Pap test and/or pelvic examination

Table 2

Demographic and clinical characteristics of those scheduled for final diagnosis ($n = 4,843$) according to their status of final diagnosis

	Work-up complete ($n = 4,243$) $n(\%)$	Work-up pending ($n = 278$) $n(\%)$	Lost to follow up ($n = 322$) $n(\%)$	P-value (including pending)	P-value (excluding pending)
Age				<0.0001	0.31
25–39	1,260 (29.70)	48 (17.27)	83 (25.78)		
40–49	1,424 (33.56)	121 (43.53)	117 (36.34)		
50+	1,559 (36.74)	109 (39.21)	122 (37.89)		
Race/ethnicity				<0.0001	<0.0001
White	550 (12.96)	6 (2.16)	34 (10.56)		
Black	115 (2.71)	2 (0.72)	25 (7.76)		
Asian	260 (6.13)	16 (5.76)	14 (4.35)		
Native American	34 (0.80)	0 (0.00)	6 (1.86)		
Hispanic	2,637 (62.15)	190 (68.35)	195 (60.56)		
Unknown	647 (15.25)	64 (23.02)	48 (14.91)		
History of prior Pap test				0.025	0.01
Yes	3,436 (80.98)	232 (83.45)	242 (75.16)		
No	207 (4.88)	11 (3.96)	27 (8.39)		
Unknown	600 (14.14)	35 (12.59)	53 (16.46)		
Result of Pap test				<0.0001	<0.0001
Abnormal	1,251 (29.48)	33 (11.87)	241 (74.84)		
Minor abnormal	2,237 (52.72)	198 (71.22)	62 (19.25)		
Unsatisfactory	208 (4.9)	8 (2.88)	10 (3.11)		
Negative	547 (12.89)	39 (14.03)	9 (2.80)		
Previous screening cycle				<0.0001	<0.0001
Yes	1,303 (30.71)	104 (37.41)	60 (18.63)		
No	2,940 (69.29)	174 (62.59)	262 (81.37)		
Abnormality of previous to the last screening cycle				0.215	0.08
Yes	74 (1.74)	5 (1.8)	10 (3.11)		
No	4,169 (98.26)	273 (98.2)	312 (96.89)		
Result of diagnosis					

	Work-up complete (<i>n</i> = 4,243) <i>n</i> (%)	Work-up pending (<i>n</i> = 278) <i>n</i> (%)	Lost to follow up (<i>n</i> = 322) <i>n</i> (%)	<i>P</i> -value (including pending)	<i>P</i> -value (excluding pending)
Normal	2,236 (52.7)				
Mild	993 (23.4)				
Moderate or severe	781 (18.41)				
Cancer	101 (2.38)				
Other	110 (2.59)				
Missing info	22 (0.52)				

Table 3

Demographic and clinical characteristics of those scheduled for treatment initiation ($n = 1,003$) according to their status of treatment

	Work-up complete ($n = 922$) $n(\%)$	Work-up pending ($n = 19$) $n(\%)$	Lost to follow up ($n = 62$) $n(\%)$	P-value (including pending)	P-value (excluding pending)
Age				0.34	0.24
25–39	321 (34.82)	4 (21.05)	28 (45.16)		
40–49	281 (30.48)	7 (36.84)	17 (27.42)		
50+	320 (34.71)	8 (42.11)	17 (27.42)		
Race/ethnicity				0.36	0.25
White	143 (15.51)	2 (10.53)	13 (20.97)		
Black	33 (3.58)	0 (0.00)	2 (3.23)		
Asian	41 (4.45)	2 (10.53)	5 (8.06)		
Native American	13 (1.41)	1 (5.26)	0 (0.00)		
Hispanic	553 (59.98)	11 (57.89)	38 (61.29)		
Unknown	139 (15.08)	3 (15.79)	4 (6.45)		
History of prior Pap test				0.71	0.43
Yes	720 (78.09)	16 (84.21)	46 (74.19)		
No	62 (6.72)	1 (5.26)	3 (4.84)		
Unknown	140 (15.18)	2 (10.53)	13 (20.97)		
Result of Pap test				0.02	0.70
Abnormal	620 (67.25)	6 (31.58)	39 (62.90)		
Minor abnormal	266 (28.85)	11 (57.89)	19 (30.65)		
Unsatisfactory	14 (1.52)	0 (0.00)	2 (3.23)		
Negative	22 (2.39)	2 (10.53)	2 (3.23)		
Previous screening cycle				0.27	0.80
Yes	206 (22.34)	7 (36.84)	12 (19.35)		
No	716 (77.66)	12 (63.16)	50 (80.65)		
Abnormality of previous to the last screening cycle				0.69	0.55
Yes	27 (2.93)	18 (94.74)	1 (1.61)		
No	895 (97.07)	1 (5.26)	61 (98.39)		
Result of final diagnosis				<0.0001	0.36

	Work-up complete (<i>n</i> = 922) <i>n</i> (%)	Work-up pending (<i>n</i> = 19) <i>n</i> (%)	Lost to follow up (<i>n</i> = 62) <i>n</i> (%)	<i>P</i> -value (including pending)	<i>P</i> -value (excluding pending)
Normal					
Mild	115 (12.47)	8 (42.11)	5 (8.06)		
Moderate or severe	678 (73.54)	6 (31.58)	51 (82.26)		
Cancer	92 (9.98)	1 (5.26)	3 (4.84)		
Other	37 (4.01)	4 (21.05)	3 (4.84)		

Table 4

Cox proportional hazard regression analysis of factors associated with time from screening to final diagnosis being scheduled (Diagnostic work-up planned on basis of abnormal Pap test or pelvic exam; $n = 4,843$)

Characteristics	Hazard ratio	Standard error	P-value
Age			
25–39	1.28	0.04	<0.0001
40–49	0.99	0.04	0.88
50+	1.00 ^a	–	–
Race/ethnicity			
White	1.00 ^a	–	–
Black	0.79	0.10	0.02
Asian	0.85	0.08	0.03
Native American	0.60	0.18	0.01
Hispanic	0.65	0.05	<0.0001
Unknown	0.62	0.06	<0.0001
History of prior Pap test			
Yes	1.09	0.07	0.26
No	1.00 ^a	–	–
Unknown	1.11	0.08	0.22
Result of Pap test			
Abnormal	0.77	0.05	<0.0001
Minor abnormal	0.71	0.05	<0.0001
Unsatisfactory	1.01	0.08	0.93
Negative	1.00 ^a	–	–

^aFor each categorical variable, the group with an odds ratio of 1.00 is the reference group. Higher hazard ratio corresponds to shorter time interval

Logistic regression analysis of factors associated with whether women with *Abnormal* or *Minor Abnormal*/Pap test results were scheduled for treatment

Table 5

	<i>Abnormal (n = 1,959)</i>			<i>Minor Abnormal (n = 7,604)</i>		
	Odds ratio	Standard error	P-value	Odds ratio	Standard error	P-value
Age						
25-39	2.24	0.14	<0.0001	3.21	0.17	<0.0001
40-49	1.24	0.13	0.10	1.01	0.19	0.98
50+	1.00	-	-	1.00	-	-
Race/ethnicity						
White	1.00	-	-	1.00	-	-
Black	0.43	0.31	0.01	0.43	0.45	0.06
Asian	0.44	0.28	0.00	0.51	0.38	0.07
Native American	0.86	0.53	0.78	0.50	0.61	0.26
Hispanic	0.61	0.16	0.00	0.56	0.18	0.00
Unknown	0.47	0.21	0.00	0.66	0.24	0.08
Abnormality of previous to the last screening cycle						
Yes	0.09	0.24	<0.0001			
No	1.00 ^c	-	-			

For each categorical variable, the group with an odds ratio of 1.00 is the reference group. ^aAbnormality of previous to the last screening cycle" was not a significant factor for the *Minor Abnormal* group