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Improving universal prenatal screening for human immunodeficiency virus

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Objective: To evaluate the effect of implementation of a human immunodeficiency virus (HIV) educational intervention on universal screening for HIV in a prenatal clinic setting.

Methods: In this retrospective cohort study, frequencies of offering and acceptance of HIV testing were compared before and after an educational intervention performed by an HIV-focused nurse. The records of 293 women seeking prenatal care before the intervention and 206 women seeking prenatal care after the intervention were reviewed for offering and acceptance of HIV testing. Fisher's exact test and logistic regression were used to evaluate the relationship between the educational intervention and the offering and acceptance of HIV testing.

Results: The frequency of HIV test offering at first visit and test acceptance before the educational intervention were 96.5% and 74.8%, respectively, and after the intervention were 99.5% and 84.3%, respectively. This improvement in offering (3% change) and acceptance (9.5% change) was statistically significant (offering at first visit: OR = 7.27, 95% CI = 1.02 to 316.9; test acceptance: OR = 1.82, 95% CI = 1.14 to 2.88). Test acceptance was statistically significantly improved in the post-intervention group after controlling for confounding variables (OR = 2.02, 95% CI = 1.2 to 3.39).

Conclusion: The addition of an HIV-focused nurse to a clinic setting improved the frequency of test offering at first visit and of acceptance of HIV testing by pregnant women.

Key words: UNIVERSAL SCREENING; HIV TESTING; PREGNANCY; PRENATAL SCREENING; HIV

INTRODUCTION

Mother-to-child transmission is the dominant mode of acquisition of HIV among young children worldwide[1]. In the USA significant progress has been made in preventing transmission, with fewer than 200 new cases of infant infection reported in 1999[1]. This was unthinkable just 10 years ago. In 1994, the US Public Health Service recommended the use of zidovudine (ZDV) during pregnancy to prevent the perinatal transmission of HIV infection[2,3]. The Pediatric Acquired Immune Deficiency Syndrome Clinical Trials Group Protocol 076 Study Group (PACTG) showed in 1994 that providing pregnant women with ZDV reduced perinatal transmission of HIV from 25.5% to 8.3%[4,5]. Other retrospective data have supported this finding[6]. Data from the PACTG trial proved that ZDV reduced transmission regardless of viral load[7]. The American College of Obstetricians and Gynecologists and the American Academy of Pediatrics both support a recommendation made by the Institute of Medicine to include a national

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policy of testing with patient notification as a routine part of prenatal care[2,8].

Despite the extremely encouraging evidence showing decreased transmission with ZDV treatment in pregnant women, screening for HIV in this population remains inadequate. Women who obtain prenatal care still complete their pregnancies without being screened. Suggestions in the literature for universal screening of all pregnant women began as early as 1991[9]. Before that time, the recommendations had been to screen only patients with risk factors[9]. Many reasons have been cited for the lack of universal screening, including limitations of provider time, lack of up-to-date education, and inequity of care[10,11]. Both prospective and retrospective studies have shown improvements in the rates of testing with protocols for universal testing[2,12,13,14]. The future holds a multitude of possibilities for improving screening. State legislation is one area in which improvements have already been made. When the state of Connecticut instituted mandatory HIV screening for all neonates if antepartum testing had not been done, the frequency of testing increased from 39.1% to 91.4%[15]. Other methods include standard protocols being created in prenatal care offices, updates in education to those providing prenatal care, and positioning of staff reminders such as posters in offices.

The purpose of this investigation was to evaluate the improvement in test offering and test acceptance achieved after the Magee-Womens Ambulatory Clinic added an HIV-focused educational nurse to their staff.

METHODS

In this investigation, a cohort of women was studied after an intervention to educate prenatal care providers, and was compared with a pre-intervention historical control. The cohort comprised women receiving prenatal care in the Women's Ambulatory Clinic at Magee-Womens Hospital before and after the addition of an HIV-focused nurse and education program (Table 1). The Ambulatory Care Clinic is a site of care for a population of predominantly low socio-economic status.

Table 1 Key elements of staff education regarding intervention

Staff	*Element*
*Nursing	Basic virology of HIV
	Pre-and post-test counseling
	Risk factors
	Timing of testing
	Offering testing
	Provider awareness of refusal
†Resident physicians and midwives	Benefits of testing
	Pre- and post-test counseling
	Risk factors
	Counseling post-refusal

*Three sessions; †two sessions.

There are seven separate clinics, including a clinic run by a certified nurse midwife, a teen clinic run by a nurse practitioner, and a clinic for medical complications of pregnancy run by a senior resident physician. All the clinics were included in this evaluation and all have direct supervision by an attending physician. The intervention involved a brief standardized educational program provided by the intervention nurse and focused on the importance of universal screening for HIV as well as non-confrontational methods of patient education and counseling, with the goal of improving acceptance rates of testing in the clinic.

This initial program was followed by the continued presence of the nurse in the clinics and her availability for coordinating medical and social care of any HIV-positive clients in the clinics and also of their infants immediately after birth. At any one time, there were approximately 5 pregnant women with HIV infection within the clinic system.

After Institutional Review Board approval, the subjects were identified using medical records charts located in the Ambulatory Clinic. A database search was performed to identify all of the new clients between September and November 2001, i.e. during the 3 months before the interventional nurse was hired. These women comprised the pre-intervention group. The database was again searched 6 months after the nurse's interventions had begun, to identify all

new clients between July and September 2002. These women comprised the post-intervention group. The medical records were screened retrospectively by a single investigator (B.L.A.). The outcomes of interest were the proportion of patients offered testing and the proportion of patients consenting to testing. We evaluated documentation of test offering, acceptance or decline, reason for decline, self-reported risk factors and test completion.

Continuous variables were assessed for normality using the Kolmogorov-Smirnov test, through graphical evaluation, and by evaluating comparability of mean and median. Categorical variables were compared using Fisher's exact test. Univariate odds ratios were determined using logistic regression.

Individual candidate confounders and effect modifiers were tested for association with both exposure (intervention) and outcome (acceptance). Variables that demonstrated a univariate relationship ($p < 0.1$) with either exposure, outcome, or both, were considered. Forward-stepping multivariable logistic regression was used to generate adjusted odds ratios in consideration of possible confounders. Except as noted above, $p < 0.05$ was considered statistically significant. Analyses were performed using Stata 7.0 for Windows (Stata, College Station, TX, USA).

RESULTS

Patient demographics were relatively similar between the groups (Table 2). There were more African American women in the pre-intervention group. The prevalence of several risk factors was tracked, including history of intravenous drug use or sex with someone usng intravenous drugs; sex with more than five partners in 1 year; sex with a male who had been in jail; sex with a male who had sex with other males; blood transfusion; travel to an endemic area; sexual assault; sex with a known HIV-positive male; and a personal history of a sexually transmitted disease.

Sexually transmitted diseases screened in the subject's history included gonorrhea, chlamydia, trichomonas, herpes and pelvic inflammatory disease. The groups were very similar, but differed in several factors: a history of sex with more than five partners in 1 year ($p = 0.004$), a history of *Chlamydia trachomatis* infection ($p = 0.005$), and a history of herpes simplex virus infection ($p < 0.001$) were all more common in the pre-intervention group (Table 3). Test acceptance improved from 74% to 84% after the intervention ($p = 0.011$, OR = 1.82, 95% CI = 1.14 to 2.88). The adjusted odds ratio for test acceptance was 2.02 (95% CI = 1.2 to 3.4). This odds ratio was obtained after controlling for a history of sex with more than five partners in 1 year, of a psychiatric disorder requiring medication, of herpes or any sexually transmitted disease, of sex with a man who had been in jail and of alcohol abuse.

Test offering at first visit improved from 96.58% to 99.51% with intervention. The unadjusted odds ratio for test offering at first visit was 7.27 (95%CI = 1.02 to 316.9). No subjects were found to be infected with HIV.

We also evaluated the reason for decline of testing in order to direct future counseling efforts. Most commonly, there was no reason given in the charts for the client's decision to decline testing. In the charts that did state a reason for refusal, a ''recent test'' was the most frequently cited explanation. The pre-intervention group was more likely to give no reason for refusal, whereas the post-intervention group was more likely to cite a recent test as the reason for decline (Table 4).

Table 2 Patient Demographics

Characteristic	*Pre-intervention*	*Post-intervention*	*p Value*
*Median age in years (range)	22 (10–44)	22 (14–39)	0.20
†% African American	55.8%	40.6%	0.02
*Median gravidity (range)	2 (1–17)	2 (1–9)	0.72
*Median parity (range)	1 (0–12)	1 (0–6)	0.85

* Mann-Whitney U test for comparisons of medians
†Fisher's exact test for comparison of frequency.

Table 3 Historical risk factors for HIV acquisition by group

Risk factor	*Pre-intervention n (%)*	*Post-intervention n (%)*	**p Value $\alpha < 0.05$*
IVDA	17 (6.0%)	16 (7.9%)	0.42
Sex with > 5 partners/year	96 (34%)	44 (22%)	0.004
Sex with a man in jail	63 (22.9%)	44 (22.1%)	0.84
Male partners sex with men	1 (0.37%)	2 (1.0%)	0.39
Blood transfusion	2 (0.71%)	3 (1.46%)	0.41
Travel to endemic area	2 (0.71%)	0 (0%)	0.23
Sex with male IVDA	20 (7.4%)	15 (7.6%)	0.94
Sexual assault	22 (7.8%)	13 (6.3%)	0.55
Sex with HIV + ve male	1 (0.36%)	0 (0%)	0.39
Any STD	61 (21.1%)	53 (25.9%)	0.22
N. gonorrheae	24 (8.3%)	15 (7.3%)	0.69
C. trachomatis	81 (27.9%)	35 (17.1%)	0.005
T. vaginalis	33 (11.4%)	15 (7.3%)	0.13
Herpes simplex	44 (15.2%)	7 (3.4%)	< 0.001
PID	6 (2.1%)	2 (0.98%)	0.34

*Statistics using Fisher's exact test for statistical significance. IVDA, intravenous drug abuse; STD, sexually transmitted disease, PID, pelvic inflammatory disease.

Table 4 Reason for decline of HIV test: number and percentage of refusals in each group

Reason	*Pre-intervention*	*Post-intervention*	**p Value*
Recently tested	13 (21.3%)	15 (44.1%)	0.02
Denied risk	5 (8.1%)	3 (8.8%)	0.91
Fear of needles	0 (0%)	1 (2.9%)	0.18
Other	1 (1.6%)	0 (0%)	0.46
No reason given	42 (68.9%)	15 (44.1%)	0.02

*Fisher's exact test used for comparison of frequencies ($\alpha < 0.05$).

DISCUSSION

Our data demonstrate that improvement in universal HIV screening of women attending prenatal clinics can be achieved with the addition of an HIV-focused nurse educator. Training aimed at prenatal care providers improved both test offering at first visit and acceptance of HIV testing. Most importantly, our data revealed an improvement in test acceptance from 74% to 84% after the intervention, with an adjusted odds ratio of 2.02 (95% CI = 1.2 to 3.4). It is the ultimate goal of proper counseling and education to maximize test acceptance rates in order to identify as many infected pregnant women as possible. The fact that the subjects in the post-intervention group were less likely to have given no reason for refusal implies that the educational intervention resulted in improved counseling of pregnant women by care providers.

Prospective studies are ideal for decreasing selection bias and confounding variables, but there is the potential for cross-over effect. One strength of this study was its historical cohort nature, in that there was no possibility for the control group to have been affected by the intervention. Another strength lies in the fact that the pre- and post-intervention provider groups consisted of the same small number of providers.

By virtue of being a retrospective study, there are inherent limitations. Results were subject to bias related to sampling errors. Although the demographics of the client groups were somewhat different, the results were significant after

analysis in a multiple regression model. Another limitation was the inability to account for secular trends in test offering and acceptance because of the historical control group. Unfortunately, the improved rate of test acceptance of 84% was still below the national recommended standard of 90%. The reasons for this remain unclear and may be related to geographical and socioeconomic factors in the study population.

A third limitation of the study is that it was performed in a setting that may not allow its results to be generalizable to other populations. For example, the rates of screening in a private office or a more basic primary care setting may be much higher or lower than those reported here and may not be affected as significantly by the presence of an educational intervention. A larger trial would be necessary to evaluate the rates of screening in various settings in order to assess the effectiveness of such an intervention.

Some countries and states have begun a policy of opt-out rather than opt-in HIV testing for prenatal care clients. In the opt-out system, rather than requiring written informed consent to get a test performed, it is explained to the woman that HIV is one of the routine prenatal blood tests. She can then opt out of testing if she desires. It is thought that this decreases the stigma associated with HIV testing and improves compliance. In Alabama and several sites in Canada, opt-out testing has greatly improved compliance with universal testing[16]. The group at the University of Alabama reported results similar to ours with opt-out testing, citing testing rates that increased from 75% to 88%[17]. Pennsylvania currently has opt-in testing and has mandatory non-anonymous state reporting for clients who test positive for HIV. There are, however, state-designated anonymous testing sites. Our Ambulatory Care Clinic is not one of the anonymous testing sites.

The population studied was at relatively high risk of HIV infection, in view of the prevalence of other sexually transmitted infections (Table 3). If a significant proportion of a high-risk population knew this, testing might be more willingly accepted than in a low-risk population. Because we found no subjects to be infected with HIV, we doubt that there was significant bias in the rates of acceptance, as compared with a general population.

Mother-to-child transmission of HIV-1 remains at astronomic proportions worldwide. In the USA, because of superior access to care and technology, efforts have been made to minimize transmission in a variety of ways. Prenatal treatment of HIV-positive women with highly active anti-retroviral therapy has resulted in minimal transmission rates[18]. In order to treat such women successfully, however, their HIV status must be known. Universal screening of pregnant women has been recommended with varying success rates for the completion of screening. In order to assure compliance with treatment, near perfect compliance with screening is necessary. This study found an improved rate of test acceptance after training of prenatal care providers.

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