Editorial

In this issue, Gibert et al describe the association between HIV disease and self-perceived changes in body appearance in a cross-sectional survey of 779 antiretroviral-naïve patients. Their findings show that male subjects having either a prior AIDS diagnosis or a low CD4+ lymphocyte count reported perceived thinning of various body sites. In women, a low CD4+ lymphocyte count was related only to thinning of the buttocks. The work suggests that the use of self-assessed changes in body appearance may be of clinical use in men but not women. Further work is needed to validate if indeed self-perceived changes are related to actual changes in body size.

The ability to measure bone mineral content (BMC) in preterm infants is difficult at best. One method, quantitative ultrasound, has the potential to provide important information using this non-invasive and radiation-free technique. Using speed of sound (SOS) measurements, Oyafemi et al show very good reproducibility of measures within the same leg (mid tibia location) and agreement between legs (0.8 and 1.4%, respectively). SOS increased significantly with post-menstrual age, but was not related to gender, race, serum measures, or time to full enteral feed even thought there was relatively large biological variation within the sample population. Further work is needed prior to its use for clinical purposes, but clearly the technique has great potential.

Large epidemiological studies demand simple, quick, and inexpensive methods for the determination of body composition. One such method, leg-to-leg bioimpedance analysis (BIA), fits these criteria. As such, Wahrlich et al have compared BIA with dual-energy X-ray absorptiometry (DXA) as the criterian method. Their results showed that BIA overestimated fat-free mass and therefore underestimated percent body fat. Because leg-to-leg BIA measures only the lower body impedance, variation in body fat distribution may be responsible for the noted differences. Indeed, addition of anthropometric variables, such as hip circumference, increased the ability of BIA to predict body composition. As such the authors develop predictive equations which may be useful to investigators utilizing the same leg-to-leg BIA instrument.

Total-body potassium (TBK) can be used to estimate body cell mass (BCM) using the equation: BCM = 0.0092 × TBK. This prediction equation was developed and validated in a healthy adult population and it is unclear if the same relationship holds true in children and adolescents. In this issue, Wang et al develop a TBK-independent method for determining body cell mass (BCM) to serve as the criterion method and then compare BCM determined by TBK using the adult-derived formula. Their results showed that the adult-derived BCM model is appropriate for use in children and adolescents.

Body composition may play a key role in athletic performance. In this issue, Hind et al measure body composition (fat, lean, and bone mineral content determined by DXA) in endurance athletes. The level of athleticism was defined as elite (international level competitors), country (national level competitors), and club (athletic club level competitors). The findings revealed that there were no significant differences in body mass or absolute lean mass based on athletic level. However, absolute fat mass and percentage fat mass was significantly lower in elite athletes, regardless of gender. Bone mineral content, adjusted for body mass, did not significantly differ based on competition level. Female runners who were oligoamenorrhoeic had lower levels of body fat, a lower BMI, and lower bone mineral content; the vast majority of these athletes were in the elite category.

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Association between stage of HIV disease and self-perceived changes in body appearance

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Many HIV-infected patients report a change in body appearance. A 'Change in Body Appearance' questionnaire, previously validated, was used to assess self-perceived changes in body appearance over the four months before enrollment into a clinical trial of antiretroviral- naïve HIV-infected patients. Seven hundred seventy-nine patients completed the questionnaire. Associations by gender, age, race, prior AIDS-defining illness, $\log_{10}$HIV RNA, and CD4+ lymphocyte count, with self-perception of changes in body size at seven sites, were determined. Median age was 38 years, 54% were African-American, 21.2% women, and 40% had a prior AIDS-defining illness. A higher proportion of men reported thinning of the arms, while a higher proportion of women reported a decrease in size of breast and buttocks. Comparing men with or without a prior AIDS-defining illness, those with a prior AIDS diagnosis reported a higher frequency of thinning at six sites. For men, prior AIDS diagnosis and a lower CD4+ lymphocyte count were independently associated with perceived loss of body size at six sites. While for women no association with prior AIDS was noted and a lower CD4+ lymphocyte count was only associated with smaller buttocks. With advanced HIV disease, men and women had different perceptions of change in body appearance. Overall, the questionnaire identified changes in body appearance for men and would be clinically useful to monitor self-perceived changes in body appearance of antiretroviral-naive men.

Key words: body appearance questionnaire; gender differences; HIV or AIDS; self-perception.

Introduction

Early in the HIV epidemic weight loss and muscle wasting were well-recognized and common complications of disease progression. Ongoing weight loss, with depletion of body cell mass, both lean and fat, was a predictor of mortality [1–3]. With the introduction of highly active antiretroviral therapy (HAART), changes in body composition and morphology, postulated to be associated with protease inhibitor usage, were reported [4]. A lipodystrophy syndrome was described that was characterized by changes in body shape including fat wasting of the face and extremities, visceral abdominal fat accumulation, development of 'buffalo hump' in the dorsocervical region, breast enlargement, and benign symmetric lipomatosis [5, 6]. Metabolic complications were also described including dyslipidemia, abnormal glucose homeostasis, and insulin resistance [7–9].

The pathogenesis of the body composition changes and metabolic alterations is complex and may be associated with HIV disease as well as antiretroviral medications. Multiple factors contribute to changes in body composition and may result in unique syndromes characterized by predominately lipoatrophy or lipohypertrophy [10–13].

In an effort to better define and characterize the lipodystrophy syndrome, various techniques, such as computerized tomography, magnetic resonance imaging, dual energy x-ray absorptiometry, ultrasonography, and bioelectric impedance analysis have been used to assess and monitor changes in body composition and body fat distribution [14–19]. Most of these techniques, however, are not routinely available to the clinician.

Anthropometric measurements for determining body fat deposition are inexpensive, noninvasive. Specific training is, however, required. This technique

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is most useful for the detection of regional changes in subcutaneous fat stores [20, 21].

Several studies have noted that changes in body appearance in association with HIV disease or its treatment may be associated with patient distress and have substantial negative impact on quality of life [22]. Thus, it is important to gain insights from the patients' perspective on their perception of changes in their body appearance. Questionnaires have been used to gather such information from patients [23, 24]. The case definition for the lipodystrophy syndrome proposed by Carr et al was derived in part from a previously developed patient-administered questionnaire [4, 10]. Questionnaires are also available to assist the provider to assess changes in patient body appearance [22, 23]. Discrepancies have been reported between patient self-perception of body appearance changes and those of the clinician [23–25]. Despite the inherent limitations of self-reporting of changes in body appearance, a patient questionnaire provides a simple measure for assessments over time in the clinical setting.

The 'Change in Body Appearance' questionnaire was developed by the Terry Beirn Community Programs for Clinical Research on AIDS (CPCRA) in order to be utilized in a study entitled 'Flexible Initial Retrovirus Suppressive Therapies' (FIRST, CPCRA 058) study. The questionnaire was administered to antiretroviral-naïve patients at baseline prior to the initiation of antiretroviral therapy. We report on baseline self-reported changes in body appearance and risk factors associated with such changes in a diverse antiretroviral-naive cohort.

Methods

Study population

Antiretroviral-naïve patients enrolled in the FIRST study were randomized to one of three treatment strategies: a protease inhibitor (PI)-containing regimen; non-nucleoside reverse transcriptase inhibitor (NNRTI) containing regimen; and a regimen containing both a PI and an NNRTI. Between February 5, 1999 and January 11, 2002, 1397 patients were enrolled in the FIRST study. Since the 'Change in Body Appearance' questionnaire was developed after the initiation of the FIRST study, only 779 of the 1397 enrolled patients completed the questionnaire at baseline.

Patients were eligible for study enrollment if they were 13 years or older and had HIV infection documented by either positive ELISA and Western blot assays or a measurable HIV-1 RNA. Women of childbearing potential were eligible if they agreed throughout the study to use of a barrier method of birth control. Patients were excluded if they had prior use of either an NNRTI or PI, or had a cumulative use of greater than four weeks of any nucleoside reverse transcriptase inhibitor (NRTI), or use of lamivudine therapy for more than one week. Women who were pregnant or breastfeeding were excluded from the study.

The research protocol and the consent form were approved by the National Institute of Allergies and Infectious Diseases and by the institutional review board at all study sites. Each participant was required to sign an informed consent at the time of study entry.

Baseline assessments

A medical history was obtained at study entry that included demographic characteristics, HIV risk factors, prior HIV disease-related diagnoses, and current medications. A physical examination was conducted. The CD4+ lymphocyte count (determined by local laboratories), and plasma HIV-1 RNA measurement (ultrasensitive RT-PCR assay version 1.0; HIV Monitor, Roche Diagnostics – conducted at a central CPCRA laboratory) were obtained.

The 'Change in Body Appearance' questionnaire was previously validated in 227 patients in the metabolic sub-study (CPCRA 061) of FIRST [https://sdmc.cpcra.org/CRFormsIndex.htlm – ('Module Forms' – Change in Body Appearance)]. In the sub-study, prior to initiation of antiretroviral therapy, patients completed the questionnaire as well as anthropometric measurements of body circumferences and skin folds. These measurements correlated well with patient self-perception of changes in body appearance. This correlation of anthropometric measurements with the questionnaire data served to validate the questionnaire [26]. As in the sub-study, in the FIRST study, trained research staff members administered the questionnaire. The results presented here on 779 patients include the 227 patients in the original metabolic sub-study, all of whom were enrolled in the FIRST study.

The 'Change in Body Appearance' questionnaire collected information on self-reported changes in body appearance over the four months prior to study enrollment [26]. It included questions related to changes in the appearance of the face, the shape of the arms, the size of the breasts, the size of the waist, the shape of the buttocks, the shape of the thighs, and in the appearance of veins in the arms and/or the legs. Questions were also asked regarding the occurrence of buffalo hump and lipomas. Since few patients reported either, or had received treatment for changes in body composition, these data were excluded from the analysis.

Statistical analysis

Summary statistics for the baseline characteristics were computed, stratified by gender, and compared by χ^2 test or Student's *t*-test. The gender-specific odds ratios of the frequency of thinning by prior AIDS diagnosis were computed and compared to one. The two gender-specific odds ratios were compared by adding an interaction term, gender by prior AIDS, to the logistic model. Multivariate logistic regression analyses were used to ascertain the association of each baseline variable with the occurrence of thinning of the respective body area in the presence of other baseline variables.

Table 1. Baseline characteristics by gender

Baseline characteristics	Female (n=165) Mean	SD	Male (n=614) Mean	SD	Overall (n=779) Mean	SD
Age (years)	38.4	9.73	38.2	9.39	38.3	9.46
Race (% non-white) *	92.7		70.0		74.8	
Latino (%)	18.8		17.8		18.0	
African-American (%)**	70.9		49.5		54.0	
Whites and other (%)	10.3		32.7		28.0	
Prior injection drug use (%)	10.9		13.9		13.3	
Prior AIDS (%)	40.0		39.4		39.5	
Prior PCP (%)	18.2		16.3		16.7	
Prior bacterial pneumonia (%)	10.3		9.1		9.4	
PCP prophylaxis (%)	50.9		49.8		50.1	
Mean CD4 (cells/mm^3)	203.3	181.97	188.0	178.7	191.2	179.42
Median CD4 (cells/mm^3)	164.0		139.3		149.0	
Mean $\log_{10}$RNA (copies/ml)	5.0	0.82	5.1	0.70	5.1	0.72
Median $\log_{10}$RNA (copies/ml)	5.1		5.2		5.2	
Weight (kg)**	69.6	18.56	73.7	14.81	72.8	15.76
BMI (kg/m^2) **	26.2	6.96	23.9	4.56	24.4	5.24

* Significant difference between men and women, $P < 0.05$
** Significant difference between men and women, $P < 0.01$

Results

Baseline characteristics

The patient demographic and clinical characteristics are shown by gender in Table 1. The mean age was 38.3 years (range 18 to 82 years). There were 165 (21.2%) women of whom 70.9% were African-American. Fifty-four percent of the 779 patients were African-American, 18% Latino, and 28% were Caucasian or other races. Approximately 13% had a history of injection drug usage (IDU) and 39.5% had a prior AIDS-defining illness. Overall only 1.95% of men and 1.82% of women reported any use of NRTIs.

The mean CD4+ lymphocyte count was 191 cells/mm^3 with a standard deviation of ±179 cells/mm^3. The average $\log_{10}$HIV RNA was 5.1 copies/ml with a standard deviation of ±0.72 copies/ml. No differences were found by gender with respect to age, prior IDU, history of an AIDS-defining illness, $\log_{10}$HIV RNA, or CD4+ lymphocyte count. Weight was, however, significantly higher in the men than in the women (73.7 kg ± 14.8 kg vs. 69.6 kg ± 18.6 kg, $P<0.01$) while body mass index (BMI) was significantly higher in the women (26.2 ± 7.0 kg/m^2 vs. 23.9 ± 4.6 kg/m^2).

Changes in body appearance

Table 2 presents the frequency distributions by gender of the patient responses to seven questions and the results of the comparisons of the gender-specific distributions. Of the 779 patients, 61.6% reported a change in their body appearance at one or more of seven sites in the previous four months. The distributions of the responses for appearance of the face, size of the waist, and shape of the thighs for men and women were similar. The differences in the gender-specific distributions at the other four sites (shape of arms, size of breasts, shape of buttocks, and prominence of veins on arms and/or legs) were statistically significant, but the differences between the distributions were small. A higher proportion of men than women reported thinning of the arms (32.2% vs. 24.8%, $P=0.05$). A higher proportion of women, however, reported a decrease in the shape of the buttocks (29.7% vs. 25.7%, $P=0.04$), more visible veins in the arms and/or legs (17.6% vs. 8.1%, $P<0.01$), and, as would be expected, a decrease in the size of their breasts (20.6% vs. 13.4%, $P=0.01$).

Association between patient-perceived changes in body appearance and a prior AIDS diagnosis

Table 3 compares the relationship, for both men and women, between a prior AIDS diagnosis and the patient's perception of a decrease in the body size at six specific body sites and the visibility of the veins in the arms and/or legs. The results are summarized using the odds ratios and provide an index of association between patient-perceived decrease of body size and prior AIDS diagnosis. For women, no association with prior AIDS was demonstrated. Among men, those with a prior AIDS diagnosis were significantly more likely to report thinning at six of the seven body sites. The changes noted in those with prior AIDS versus those without AIDS were significantly more pronounced in men than women. Thus, there appears to be a positive association between perceived decrease of body size and prior AIDS that is significant only in men.

Table 2. Frequency distribution of responses to questions on change in body appearance by gender at baseline

	Female (n=165) %	Male (n=614) %	*P*-value
Appearance of face[a]			
Thinning of cheeks	29.1	28.8	
No change	64.2	63.5	0.91
Increase in fullnes	6.7	7.7	
Shape of arms			
Thinning of arms	24.8	32.2	
No change	66.7	63.0	0.05
Increase in thickness	8.5	4.7	
Size of breasts			
Decrease in size	20.6	13.4	
No change	72.7	83.1	0.01
Increase in size	6.7	3.6	
Size of waista			
Decrease in size	31.5	34.0	
No change	58.8	56.5	0.83
Increase in size	9.7	9.4	
Shape of buttocks			
Smaller, thinning, sagging	29.7	25.7	
No change	63.0	70.8	0.04
Larger	7.3	3.4	
Shape of thighs			
Thinning of thighs	31.5	28.7	
No change	60.6	65.6	0.39
Increase in size	7.9	5.7	
Veins in arms and/or legs			
More visible	17.6	8.1	
No change	79.4	87.3	<0.01
Less visible	3.0	4.6	

[a] For appearance of face, there were 41 reported changes not related to fullness of face. For size of waist, there were 18 reported changes not related to size. For both sites, these responses have been placed in the no change category.

Association of baseline characteristics and patient perception of changes in body appearance

Using a multivariate logistic regression model controlling for age (by 10-year increments), ethnicity, prior AIDS diagnosis, $\log_{10}$HIV RNA, and CD4+ lymphocyte count (by increments of 100 cells), the association of baseline characteristics with patient perception of changes in body appearance were assessed. For men, having a higher $\log_{10}$HIV RNA was significantly associated only with thinning of the cheeks (Table 4a). In addition, having a prior AIDS diagnosis was significantly associated with thinning at six of the seven body sites. Furthermore, a lower CD4+ lymphocyte count was significantly associated with thinning at five of the seven sites. Thus, for men, both a prior AIDS diagnosis and a decrease in CD4+ lymphocyte count were independently associated with perceived thinning at several body sites.

In terms of demographic characteristics, for men, older age was independently associated with thinning of the face and decrease in arm size. Similarly, being African-American was associated with a decrease in waist size and thinning of the thighs. History of IDU did not appear to be independently associated with patient-reported thinning at body sites (results not shown).

African-American women were more likely to report a self-perceived decrease in breast size but less likely to report more prominent veins in the arms and/or legs. In addition, reported smaller size of buttocks for women was associated with a lower CD4+ lymphocyte count. There were no other significant associations identified in women's perception of a decrease in body size and other baseline parameters (as shown in Table 4b).

Discussion

This study assessed the association of various demographic and HIV disease characteristics with patient-reported changes in body appearance in a cohort of antiretroviral-naïve patients. Using this questionnaire, we found few significant differences in the frequency of reporting thinning at various body sites and these differences were small. For men, an independent association was identified between more advanced HIV disease and perceived thinning at all but one of the body sites. These findings provide evidence that the questionnaire is useful for identifying changes in body appearance for men. The absence of similar findings for women indicates that the questionnaire may not be sensitive enough to identify similar changes for women possibly because changes for women occur at a different rate or their self-perception of these changes differs.

Men with more-advanced HIV disease were more likely to report body appearance changes consistent with previous reports of the development of wasting and weight loss with more-advanced HIV disease [27, 28]. Prior studies have documented the development of body composition changes associated with the use of antiretroviral therapy [4, 29–31]. Our cohort included only antiretroviral-naïve patients, with relatively advanced HIV disease based on a low median CD4+ lymphocyte cell count of 149 cells/mm^3 and median $\log_{10}$HIV RNA of 5.2 copies/ml, demonstrating that long-standing HIV infection without treatment affects body appearance. It is of interest that various markers of HIV disease were independently associated with reported changes in body appearance.

For women, no significant correlation between self-perception of a change in body appearance and any of the measured demographic and clinical characteristics was identified with the exception that a lower CD4+ lymphocyte count was associated with a self perception of a smaller size of buttocks. This raises the question as to why this tool was less discriminating in women. There are a number of possible rea-

Table 3. Odds ratios (prior AIDS/no AIDS) by gender of patient perception of a decrease in body size at seven sites

Site	Females Prior AIDS Yes n=66 %	Females Prior AIDS No n=99 %	Odds ratio	(95% CI)	Males Prior AIDS Yes n=242 %	Males Prior AIDS No n=372 %	Odds ratio	(95% CI)	Comparison of odds ratios *P*-value
Thinning of cheeks	33.3	26.3	1.40	(0.71, 2.77)	44.2	18.8	3.42	(2.38, 4.92)	0.02
Thinning of arms	27.3	23.2	1.24	(0.61, 2.53)	49.6	21.0	3.71	(2.60, 5.29)	0.01
Decrease in size of breasts	19.7	21.2	0.91	(0.42, 1.98)	22.7	7.3	3.76	(2.29, 6.16)	<0.01
Smaller waist	31.8	31.3	1.02	(0.52, 2.00)	49.6	23.9	3.13	(2.21, 4.42)	<0.01
Smaller buttocks	34.8	26.3	1.50	(0.76, 2.95)	42.1	15.1	4.11	(2.81, 6.02)	0.01
Thinning of thighs	36.4	28.3	1.45	(0.74, 2.82)	45.0	18.0	3.73	(2.59, 5.38)	0.01
Veins more visible in arms and/or legs	18.2	17.2	1.07	(0.47, 2.42	10.3	6.7	1.60	(0.90, 2.86)	0.43

Table 4a. Association of baseline characteristics (odds ratio) with patient perception of decrease in body size at seven sites for men

Site	Age (10 yrs older) Odds ratio (95% CI)	Ethnicity African American/other Odds ratio (95% CI)	Prior AIDS Odds ratio (95% CI)	HIV RNA (log 10) Odds ratio (95% CI)	CD4 (100 cells lower) Odds ratio (95% CI)
Cheeks	1.25 (1.02, 1.53)	0.95 (0.65, 1.38)	2.12 (1.41, 3.19)	1.39 (1.02, 1.89)	1.31 (1.13, 1.53)
Arms	1.22 (1.00, 1.48)	0.99 (0.69, 1.440	2.24 (1.50, 3.32)	1.14 (0.85, 1.54)	1.40 (1.21, 1.63)
Breasts	0.99 (0.76, 1.29)	1.27 (0.78, 2.07)	2.81 (1.61, 4.90)	1.34 (0.90, 2.00)	1.16 (0.95, 1.41)
Waist	0.93 (0.77, 1.13)	1.44 (1.01, 2.06)	2.28 (1.54, 3.370	1.23 (0.92, 1.63)	1.21 (1.06, 1.38)
Buttocks	1.01 (0.84, 1.28)	1.31 (0.88, 1.94)	2.48 (1.62, 3.80)	1.04 (0.76, 1.430	1.46 (1.23, 1.74)
Thighs	1.05 (0.86, 1.29)	1.49 (1.02, 2.19)	2.19 (1.45, 3.30)	1.29 (0.85, 1.76)	1.42 (1.21, 1.66)
Veins[a]	0.85 (0.61, 1.18)	1.38 (0.76, 2.52)	1.24 (0.64, 2.39)	1.11 (0.69, 1.77)	1.18 (0.94, 1.48)

[a] Visibility of veins in legs or arms

Odds ratios and associated *P*-values are from multivariate logistic regression model.

sons. First, the body composition of men and women may differ, with men having a small proportion of their body composition as fat compared to women who have a relatively high proportion of body fat [32]. In addition, rates of weight loss for HIV-infected men and women have been reported to be different [33]. Despite the fact that both HIV-infected men and women weighed less than their HIV-negative controls, Kotler et al reported that HIV-infected women, when compared to HIV-infected men, had higher fat mass and percentage body fat even though the men had higher body cell mass and fat-free mass [34]. Consequently, men may perceive and report changes in their body composition primarily due to changes in fat-free mass while women may observe and report fat mass changes, which may occur at a different rate than changes in fat-free mass and be perceived differently. Second, the changes in body composition thought to be related to the lipodystrophy syndrome, may, in fact, only reflect changes in body composition and appearance of men and not of women. Accordingly, this questionnaire may need to be re-evaluated to determine its sensitivity in identifying lipodystrophy in women. Validation of questionnaires designed to capture self-perceived or clinician observed changes in body appearance is needed. Such validation would require following HIV-infected patients over time, and would, ideally, also compare such patients to non-HIV-infected controls. Finally, in this study, since fewer women than men were enrolled, the power to detect changes in self-perception of body appearance among women may have been limited.

A strength of this study is that in contrast to an earlier study of Shlay et al, which utilized the same questionnaire in a limited number of patients, this study

Table 4b. Association of baseline characteristics (odds ratio) with patient perception of decrease in body size at seven sites for men

Site	Age (10 yrs older) Odds ratio (95% CI)	Ethnicity African American/other Odds ratio (95% CI)	Prior AIDS Odds ratio (95% CI)	HIV RNA (log 10) Odds ratio (95% CI)	CD4 (100 cells lower) Odds ratio (95% CI)
Cheeks	0.95	0.51	1.19	1.03	1.19
	(0.65, 1.38)	(0.24, 1.09)	(0.53, 2.68)	(0.63, 1.67)	(0.92, 1.53)
Arms	1.28	1.56	0.68	1.30	1.31
	(0.87, 1.880	(0.67, 3.62)	(0.29, 1.58)	(0.75, 2.26)	(0.99, 1.73)
Breasts	1.24	3.11	0.61	1.46	1.02
	(0.83, 1.86)	(1.09, 8.84)	(0.25, 1.49)	(0.80, 2.66)	(0.79, 1.32)
Waist	1.13	1.52	0.72	1.11	1.17
	(0.79, 1.60)	(0.70, 3.28)	(0.33, 1.56)	(0.69, 1.79)	(0.93, 1.48)
Buttocks	1.17	0.95	1.14	0.84	1.31
	(0.82, 1.67)	90.44, 2.04)	(0.52, 2.50)	(0.52, 1.35)	(1.01, 1.69)
Thighs	1.06	1.17	0.99	1.17	1.20
	(0.74, 1.52)	(0.54, 2.50)	(0.46, 2.15)	(0.72, 1.90)	(0.94, 1.53)
Veins[a]	1.11	0.39	1.26	0.90	1.00
	(0.73, 1.68)	(0.16, 0.92)	(0.48, 3.29)	(0.51, 1.57)	(0.76, 1.30)

[a] Visibility of veins in legs or arms

Odds ratios and associated *P*-values are from multivariate logistic regression model.

was able to assess changes in body appearance by gender and ethnicity [26]. In both studies, self-perception of changes in body appearance in an antiretroviral therapy-naïve patient population was assessed to identify changes independent of treatment effects. Most other studies have been in treatment-experienced patients [4, 23, 25].

Limitations of the study include the fact that only 13% of the subjects were injection drug users, only 20% were women, 70% of whom were African-American, and that Asian and other ethnic groups were not well represented. Furthermore, since patients were only asked about changes in body appearance in the four months preceding study enrollment and the study population included 40% of patients with a prior AIDS-related illness, body appearance changes may have occurred prior to that time frame. Finally, because this study is cross-sectional, this questionnaire was only administered at baseline. Prospective follow-up of this cohort will allow for an assessment of the impact of antiretroviral treatment, in addition to certain demographic and HIV disease characteristics, on patient perception of changes in body appearance.

A well-validated and simple questionnaire, specific for both men and women, would provide an expedient way to track changes in body appearance. Since the overwhelming majority of HIV disease occurs in resource-poor countries, such a simple tool could be of significant benefit in assessing disease progression. However, this study was only able to demonstrate with reasonable accuracy the value of a simple questionnaire in identifying self-perceived changes in body appearance for men with HIV infection. In view of the limitations identified, additional studies are needed, particularly in women, to improve the ability to identify their perceptions of changes in body appearance.

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