Health-Related Quality of Life in Veterans and Nonveterans with HIV/AIDS

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PURPOSE: To compare health-related quality of life (HRQoL) between patients receiving care in Veterans Administration (VA) settings (veterans) and non-VA settings (nonveterans), and to explore determinants of HRQoL and change in HRQoL over time in subjects living with HIV/AIDS.

SUBJECTS: One hundred veterans and 350 nonveterans with HIV/AIDS from 2 VA and 2 university-based sites in 3 cities interviewed in 2002 to 2003 and again 12 to 18 months later.

METHODS: We assessed health status (functional status and symptom bother), health ratings, and health values (time tradeoff [TTO] and standard gamble [SG] utilities). We also explored bivariate and multivariable associations of HRQoL measures with a number of demographic, clinical, spiritual/religious, and psychosocial characteristics.

RESULTS: Compared with nonveterans, the veteran population was older (47.7 vs 42.0 years) and consisted of a higher proportion of males (97% vs 83%), of participants with a history of injection drug use (23% vs 15%), and of subjects with unstable housing situations (14% vs 6%; $P<.05$ for all comparisons). On scales ranging from 0 (worst) to 100 (best), veterans reported significantly poorer overall function (mean [SD]; 65.9 [17.2] vs 71.9 [16.8]); lower rating scale scores (67.6 [21.7] vs 73.5 [21.0]), lower TTO values (75.7 [37.4] vs 89.0 [23.2]), and lower SG values (75.0 [35.8] vs 83.2 [28.3]) than nonveterans ($P<.05$ for all comparisons); however, in multivariable models, veteran status was only a significant determinant of SG and TTO values at baseline. Among other determinants that were associated with multiple HRQoL outcomes in baseline and follow-up multivariable analyses were: symptom bother, overall function, religiosity/spirituality, depressive symptoms, and financial worries.

CONCLUSIONS: Veterans reported significantly poorer HRQoL than nonveterans, but when controlling for other factors, veteran status was only a significant determinant of TTO and SG health values at baseline. Correlates of HRQoL such as symptom bother, spirituality/religiosity, and depressive symptoms could be fruitful potential targets for interventions to improve HRQoL in patients with HIV/AIDS.

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Highly active antiretroviral therapy (HAART) has transformed HIV/AIDS from a progressive, fatal illness to a treatable chronic disease. However, improved HIV control with antiretroviral therapy may come at the expense of substantial adverse drug effects.[1–4] Even with improved treatment and survival, HIV/AIDS can still compromise health-related quality of life (HRQoL), especially for those with side-effects from treatment and/or with more advanced disease.[5–9]

There are 2 standard approaches to assessing HRQoL: the health status approach, which describes functioning and the impact of illness on 1 or more domains of health, and the health value/utility/preference approach, which assesses the desirability of states of health against an external metric. The literature contains many published studies addressing health status in HIV/AIDS[6–12] but only a few addressing symptoms[13–15] and health values[5,16–18] in HIV/AIDS.

The Veterans Health Administration (VHA) is the largest single provider of HIV care in the United States.[19,20] Several studies have evaluated HRQoL in veterans,[21–24] and although one might expect HRQoL to differ in veterans compared with nonveterans with HIV because of differences in socioeconomic status, life experiences, and comorbidities, only 1 study published to date has directly compared HRQoL between veterans and nonveterans with HIV.[21] That study found a difference in HRQoL between patients cared for at a Veterans Affairs (VA) and a university-based clinic; therefore, it is difficult to know how generalizable studies performed exclusively in veterans or in nonveterans with HIV/AIDS may be.

Although various associations between HRQoL and other factors have been reported in a number of studies of patients with HIV/AIDS, those factors have mostly been limited to demographic and clinical parameters.[5–11,16–18] Furthermore, few studies have assessed determinants of change in HRQoL for patients with HIV/AIDS.[17,25,26] Using a conceptual framework based on the work of Wilson and Cleary[27] and Tsevat,[28] as well as our prior experience studying HRQoL in subjects with HIV[5,16] (see manuscript by Szaflarski et al. in this supplement for a complete description of our conceptual model), we hypothesized that additional variance in HRQoL might be explained via certain clinical factors (such as depression, injection drug use, and alcohol use), demographic/life experi-

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ence factors (such as being a veteran or parent), and non-health-related factors such as spirituality and religion, social support, and personality traits such as risk attitude and self-esteem. Thus, we designed a study with 3 objectives:

1. For patients with HIV/AIDS, to compare HRQoL in those cared for in VA settings (veterans) with those cared for in non-VA settings (nonveterans),
2. To explore determinants of HRQoL in subjects living with HIV/AIDS, and
3. To explore determinants of change in HRQoL over time.

METHODS

Study Design

We developed a structured questionnaire that we administered to a convenience sample of HIV-infected patients. This analysis includes complete data from the baseline interviews that took place during 2002 and 2003, as well as follow-up interviews that occurred 12 to 18 months later.

Subjects

We recruited outpatients with HIV/AIDS from 4 sites in 3 cities: the University of Cincinnati Medical Center, the Cincinnati VA Medical Center, the VA Pittsburgh Healthcare System, and George Washington University Medical Center. The institutional review boards of the participating institutions approved the study. Subjects gave written informed consent and were compensated $30 for their time and travel expenses for each interview.

Interviews

Data were obtained primarily by patient questionnaires and supplemented by chart review for treatment and clinical information. Health ratings and health values were assessed by a trained interviewer using a laptop computer running U-Maker utility assessment software (Frank Sonnenberg, New Brunswick, NJ).

Outcomes

Our HRQoL outcomes included health status (specifically functional status and symptom bother), health ratings, and health values (specifically standard gamble [SG] and time tradeoff [TTO] utilities). Functional status, symptom bother, and health ratings were also regarded as potential determinants of the other HRQoL outcomes.

Health Status. Functional status was measured using the Overall Function scale of the HIV/AIDS-Targeted Quality of Life (HAT-QoL) instrument.[29,30] The HAT-QoL consists of 34 questions that assess 9 dimensions: sexual functioning; disclosure worries; medication worries; health worries; financial worries; HIV mastery; life satisfaction; and provider trust, in addition to overall functioning. Each subscale is scored from 0 (worst) to 100 (best). The measure has been found to be reliable and valid, with the overall function domain having a Cronbach's α of 0.89.[29]

Symptom Distress. We used the 20-question HIV Symptom Index (HSI; also known as the Symptoms Distress Module) to assess symptom distress.[23,31,32] Each of the 20 symptoms was endorsed on a 5-point Likert scale ranging from 0 to 4, with 0 representing the absence of that symptom and 4 indicating that the patient has the symptom and it bothers them "a lot." The HSI is strongly associated with the physical and mental health summary scales of the MOS-HIV measure and with disease severity, independent of CD4 cell count and viral load.[32]

Health Ratings. We administered a health rating scale (RS) question in the form of a "feeling thermometer," in which subjects were asked to rate their current health state along a scale ranging from 0 (dead) to 100 (perfect health). The RS has been shown to have a same-day test-retest reliability of 0.86 to 0.94 and a 1-week test-retest reliability of 0.77.[33]

Time Tradeoff. The TTO assesses one's willingness to live a shorter-but-healthier life.[33] The TTO was posed as a choice between living x years in one's present state of health versus (x–t) years in perfect health. We chose x to approximate the mean life expectancy among all subjects: 15 years. Time t was varied systematically in a ping-pong fashion[34] until an indifference point was found between living 15 years in one's current state of health and (15–t) years in perfect health. The output of the TTO is a utility equal to (15 –t)/15 such that scores range from 0 (dead) to 1 (perfect health); for ease of comparison with other HRQoL scales, we linearly transformed TTO results to range from 0 to 100. The TTO has been found to have a test-retest reliability of 0.77 to 0.88.[33]

SG. The SG assesses one's willingness to risk immediate death in exchange for a chance of having perfect health.[33] The SG was posed as a choice between: (1) the certainty of living the rest of one's life in one's current state of health, or (2) a gamble between perfect health for the remainder of life with P versus immediate death with probability (1–P). The P was varied systematically in a ping-pong fashion until the subject was indifferent between preferring the certainty of living the rest of his/her life in their current state of health and preferring the gamble. The indifference P_i equals the utility for the patient's current state of health. Here, too, we linearly transformed the results to range from 0 to 100. The SG has been shown to have a test-retest reliability of 0.77 to 0.92.[33]

Independent Variables

Demographics/Life Experience. Demographic data were self-reported by subjects. Data collected included date of birth, sex, race, sexual orientation, marital status, housing status (with housing situation considered to be unstable if subjects endorsed "transient/live in shelter" or "homeless"), education level, employment status, insurance status, number of children, number of other dependents, alcohol use, and injection drug use. If subjects received care at a VA Medical Center, then they were defined as veterans for our analyses; otherwise, they were considered nonveterans. We assessed religious affiliation by using a single item asking, "What is your religious preference?" Participants were given one of 20 specific religions and denominations from which to choose, or could choose "none," "other specific," or "undesignated." For analytical purposes, the variable was dichotomized as having a religion (the subject endorsed any of the 20 specific religions or endorsed "other specific") versus not having a religion (endorsed "none" or "undesignated").

Disease Measures. Clinical data, collected from the medical record, included year diagnosed with HIV; history of opportunistic infections; lowest and current CD4 count; highest and current viral load; and current antiretroviral treatment.

Depressive Symptoms. We administered the 10-item Center for Epidemiological Studies-Depression Scale (CESD-10).[35] Each of the 10 questions captures the frequency of a particular mood or symptom in the prior week using a 4-point scale ranging from 0 (none of the time) to 3 (most of the time). After reversing the positive mood items, scores on the items are summed such that they range from 0 (best) to 30 (worst).[23,35] The full CES-D has been shown to have internal consistency coefficients ranging from 0.63 to 0.93 and test-retest reliability of 0.61.[36,37]

Social Support. To capture perceived availability of social support, we used the Interpersonal Support Evaluation List (ISEL), which has been found to have an internal consistency reliability coefficient ranging from 0.88 to 0.90.[38,39] We used the 12-item version of the ISEL, in which each item was endorsed on a 4-point Likert scale.[1–4] After reversing negative items, the responses were summed to provide a total social support score (range: 12 [low] to 48 [high]).

Spirituality. Spirituality was measured by using the 23-item Functional Assessment of Chronic Illness Therapy-Spiritual Well-being Expanded scale (FACIT-SpEx).[40,41] Responses are provided on a 5-point Likert scale (0 to 4). After reversing negative items, responses were summed to yield an overall spirituality score (range: 0 [low] to 92 [high]). The measure has evidence of good internal reliability (Cronbach's α=0.92) and convergent validity with other measures of religion and spirituality.[40,41]

Religiosity. To address religiosity, we administered the Duke Religion Index, a 5-item measure assessing 3 aspects of religiousness: organized religious activity (attendance at religious services; scored from 1 [never] to 6 [more than once a week]), nonorganized religious activity (prayer, meditation, or text study; scored from 1 [never] to 6 [more than once a week]), and intrinsic religiosity (subjective views on religion and religious experience; scored from 3 to 15, with higher scores indicating greater intrinsic religiosity).[42] Because published psychometric properties are not available, we calculated the Cronbach's α for the intrinsic religiosity subscale, which was 0.88.

Religious Coping. We administered the Brief RCOPE, which was designed to offer an efficient, theoretically meaningful way to assess the roles of religion in coping.[43] The scale consists of 7 positive and 7 negative religious coping items derived from the full RCOPE through factor analysis.[44] The positive items assess the following types of positive religious coping: spiritual connection, seeking spiritual support, religious forgiveness, collaborative religious coping, benevolent religious reappraisals, religious purification, and religious focus. The negative items tap 5 types of negative religious coping: spiritual discontent, punishing God reappraisals, interpersonal religious discontent, demonic reappraisals, and reappraisals of God's powers. Participants responded to each item on a 4-point Likert-type scale to indicate how much or how frequently they used the particular way of coping ("not at all," "somewhat," "quite a bit," or "a great deal"). This brief scale has high internal consistency (α=0.81 to 0.90) and good discriminant validity.[43]

Health Concerns. Health concerns were measured by using 5 of 9 dimensions of the HAT-QoL: disclosure worries; health worries; financial worries; HIV mastery (comfort with how the patient acquired HIV); and provider trust.[29,30] The instrument has been shown to exhibit good psychometric properties, including low ceiling/floor effects, good internal consistency, and construct validity.[29,30]

Self-Esteem. We used Rosenberg's 6-item global self-esteem measure, which consists of 3 positively framed items and 3 negatively framed items, each scored from 1 to 4.[45–47] A total score for the 6 items was calculated by summing the responses after reversing the negative ones. The Rosenberg measure has been found to have a Cronbach's α of 0.88.[48]

Risk Attitude. To assess attitudes about taking risks, we administered the 6-item risk-taking scale from the Jackson Personality Index.[49] Response categories range from 1 (strongly agree) to 6 (strongly disagree). After reversing 3 items, results were summed to yield a score between 6 and 36, with higher scores indicating greater risk-seeking attitudes. The Cronbach's α for this version of the scale is 0.71.[49]

Analyses

Descriptive statistics included means and SDs for continuous variables and percents for categorical variables. Missing data for the outcome measures were not imputed except that missing items on the HSI were considered to be 0 (i.e., that symptom was not present). As previously described by Kilbourne et al.,[23] because 5 items of the HSI (fatigue, memory, sadness, anxiety, and insomnia) relate closely to analogous elements of the CESD-10, we did not analyze those 5 HSI items. Of the remaining 15 items, we counted the number of symptoms considered to be bothersome ("it bothers me" or "it bothers me a lot"), yielding a possible score between 0 and 15.[23]

We developed multivariable linear regression models to assess correlates of HRQoL at baseline and follow-up. The follow-up models included the baseline variable value as a predictor and also baseline and change values for the potential predictor variables. In both the baseline and follow-up models, predictor variables significantly associated with the outcome variables in bivariate analyses at a $P<.10$ level were entered as candidate variables into the models, as were additional variables found to be significant in previous research (e.g., age and race with functional status). Final models were determined by using backwards elimination, retaining only significant factors ($P<.05$); however, to assess potential multicollinearity, elimination was not automated but was performed by hand, and robustness of the final models was assessed by substituting and adding variables felt possibly to be collinear. The final models were found to be robust to those evaluations. No corrections were made for multiple statistical analyses; however, *P*-values are presented. Analyses were conducted by using SAS, version 8.0 (SAS Institute, Cary, NC).

RESULTS

Participant Characteristics

Of the 450 subjects interviewed at baseline, 100 (22%) were veterans and 350 (78%) were nonveterans. The mean (SD) age

Table 1. Participant Demographic and Clinical Characteristics at Baseline

Characteristic	Whole Cohort at Baseline (*N*=450)	Veterans at Baseline (*N*=100)	Nonveterans at Baseline (*N*=350)	Follow-up Cohort at Baseline (*N*=347)
Mean (SD) age (y)	43.3 (8.4)	47.7 (8.9)*	42.0 (7.8)*	43.7 (8.3)
Male (%)	86	97*	83*	87
White (%)	45†	51	44	50†
Ever used injection drugs (%)	16	23*	15*	16
Mean (SD) alcohol use (drinks/mo)	12.5 (30.2)	11.0 (23.9)	12.9 (31.7)	12.8 (30.6)
Unstable housing (%)	8	14*	6*	7
Mean (SD) duration of disease (y)	8.4 (5.3)	9.0 (4.9)	8.2 (5.4)	8.5 (5.3)
Mean (SD) CD4 cell count (cells/μL)	420 (301)	408 (318)	424 (296)	420 (305)
History of AIDS-defining illness (%)	36	40	35	36
On HAART (%)	76	81	75	78

HAART, highly active antiretroviral therapy.
**P<.05 for difference between veterans and nonveterans.*
†P<.05 for difference between baseline and follow-up cohort.

of the cohort was 43.3 (8.4) years; 387 (86%) were male, and 61 (of 432 who responded; 16%) reported ever using injection drugs (Table 1). The mean (SD) CD4 cell count was 420 (301); 162 (36%) had a history of having an AIDS-defining illness; and 342 (76%) were on HAART. Compared with nonveterans, the veteran population was older (47.7 vs 42.0 years) and consisted of a higher proportion of males (97% vs 83%), of participants with a history of injection drug use (23% vs 15%), and of subjects with unstable housing situations (14% vs 6%; $P< .05$ for all comparisons). A total of 347 (77%) subjects were interviewed at follow-up. Baseline characteristics of the follow-up cohort were similar to the baseline cohort except that patients completing both interviews were more likely to be white (50% vs 45%).

Independent variables had similar means or proportions among veterans and nonveterans except that veterans engaged significantly more frequently in nonorganized religious activity (mean [SD]; 3.3 [1.9]) than nonveterans (2.8 [1.9]; $P<.05$; Table 2). Independent variable values changed little, on average, for the cohort between the 2 assessments with only 3 variables showing significant changes over time (health worries, disclosure worries, and intrinsic religiosity); however, there was substantial variability on the individual level as noted by the SD of the changes.

HRQoL

Whole Cohort. At baseline, the mean (SD) overall function score was 70.6 (22.9). The number of bothersome symptoms was 3.2 (3.2); health rating, 72.2 (21.6); TTO value, 86.1 (27.5); and SG value, 81.3 (30.2; Table 3).

Veterans and Nonveterans. Veterans reported, on average, significantly poorer overall function (65.9 [22.0] vs 71.9 [23.1]); lower health ratings (67.6 [21.0] vs 73.5 [21.7]); lower TTO values (75.7 [37.4] vs 89.0 [23.2]); and lower SG values (75.0 [35.8] vs 83.2 [28.2]) than nonveterans ($P<.05$ for those comparisons; Table 3). In multivariable analyses that included

Table 2. Other Subject Characteristics

Scale (possible range)	Whole Cohort Mean (SD)	Veterans Mean (SD)	Nonveterans Mean (SD)	Change Between Baseline and Follow-up Mean (SD)
Depressive symptoms (0 to 30, higher score=more depressive symptoms)	11.0 (7.0)	11.8 (7.5)	10.8 (6.9)	–0.4 (5.1)
Health worries (0 to 100, higher score=fewer worries)	70.0 (27.1)	69.3 (27.9)	70.2 (26.9)	3.7 (24.8)*
Financial worries (0 to 100, higher score=fewer worries)	57.1 (34.6)	53.8 (31.3)	58.1 (35.5)	2.6 (30.1)
HIV mastery (0 to 100, higher score=greater comfort)	67.7 (32.5)	66.9 (33.3)	68.0 (32.3)	2.7 (27.8)
Disclosure worries (0 to 100, higher score=fewer worries)	57.3 (28.4)	54.5 (27.8)	58.2 (28.5)	4.3 (24.2)*
Provider trust (0 to 100, higher score=more trust)	79.5 (24.1)	76.4 (25.4)	80.4 (23.6)	–0.8 (28.4)
Perceived social support (12 to 48, higher score=more perceived support)	37.7 (8.3)	36.4 (8.5)	38.0 (8.3)	0.1 (6.4)
Self-esteem (6 to 24, higher score=more self-esteem)	19.6 (3.6)	19.8 (3.8)	19.5 (3.5)	–0.1 (2.8)
Risk attitude (6 to 36, higher score=more risk-seeking)	18.9 (5.4)	18.9 (5.7)	18.9 (5.3)	0.3 (5.8)
Spirituality (0 to 92, higher score=more spiritual)	63.5 (19.3)	58.8 (18.9)	61.4 (17.2)	0.8 (13.4)
Organized religious activity (1 to 6, higher score=more religiously active)	3.0 (1.7)	2.9 (1.7)	3.0 (1.7)	0.0 (1.1)
Nonorganized religious activity (1 to 6, higher score=more religiously active)	2.9 (1.9)	3.3 (1.9)†	2.8 (1.9)†	–0.2 (1.5)
Intrinsic religiosity (3 to 15, higher score=more religious)	11.2 (3.6)	11.6 (3.4)	11.1 (3.7)	–0.3 (2.5)*
Positive religious coping (7 to 28, higher score=greater positive religious coping)	17.7 (6.4)	17.8 (6.3)	17.6 (6.5)	–0.1 (4.1)
Negative religious coping (7 to 28, higher score=greater negative religious coping)	10.7 (4.3)	10.9 (4.2)	10.7 (4.4)	–0.2 (3.6)

**P<.05 for change (significantly different from 0).*
†P<.05 for difference between veterans and nonveterans.

Table 3. Health-Related Quality of Life Outcomes

Characteristic	Whole Cohort Mean (SD)	Veterans Mean (SD)	Nonveterans Mean (SD)	Change Between Baseline and Follow-up Mean (SD)
Overall function (0 to 100, higher score = better functioning)	70.6 (22.9)	65.9 (22.0)*	71.9 (23.1)*	0.5 (21.3)
Number of bothersome symptoms (0 to 15, higher score = more bothersome symptoms)	3.2 (3.2)	3.5 (3.3)	3.0 (3.1)	0.0 (2.7)
Health rating scale (0 to 100, higher score = better health rating)	72.2 (21.6)	67.6 (21.0)*	73.5 (21.7)*	1.1 (20.5)
Time tradeoff (0 to 100, higher score = greater value for current health)	86.1 (27.5)	75.7 (37.4)*	89.0 (23.2)*	0.8 (27.0)
Standard gamble (0 to 100, higher score = greater value for current health)	81.3 (30.2)	75.0 (35.8)*	83.2 (28.2)*	–2.3 (34.8)

*$P < .05$ for difference between veterans and nonveterans.

participant characteristics (age, race, education, employment, housing stability, drug use, alcohol use, CD4 cell count, history of AIDS defining conditions, duration of disease, and viral load) as well as veteran status, veteran status remained a significant independent variable for only the TTO ($\beta = -11.91$; $P = .0003$) and SG ($\beta = -7.36$; $P = .0352$) dependent variables.

Change in HRQoL Over Time. None of the mean HRQoL values changed significantly over time (Table 3). However, as noted by the SDs, there was substantial individual variability in HRQoL outcomes over time.

Determinants of HRQoL at Baseline

In bivariate assessments, a number of factors were significantly correlated with all HRQoL outcomes. Specifically, employment, significant depressive symptoms, health worries, financial worries, HIV mastery, provider trust, perceived social support, self-esteem, spirituality, symptom bother, and overall functioning were associated with HRQoL. Several other factors were significantly correlated with all but one of the HRQoL outcomes, and they included education, veteran status, duration of disease, history of AIDS-defining conditions, disclosure worries, organized religious activity, and negative religious coping. In bivariate analyses, CD4 cell count and viral load were not significantly associated with health values but they were associated with other HRQoL outcomes (CD4 cell count with health ratings and both with health status).

In multivariable analyses, HRQoL measures were significantly associated at baseline with a number of factors (Table 4). In multiple multivariable models, less symptom bother; better overall function; fewer depressive symptoms; greater levels of spirituality; greater self-esteem; being employed; being a nonveteran; and having less severe disease were all associated with better HRQoL.

Correlates of HRQoL at Follow-up

Overall Function. In addition to higher baseline overall function score, improvement in the health worries score, higher baseline and improvement in the financial worries scores, employment, improvement in self-esteem, increase in level of organized religious activity, and positive change in positive religious coping score were all associated with improvements in overall function at follow-up, whereas veteran status was not (Table 5). Greater baseline depressive symptomatology, increase in depressive symptoms, and positive change in intrinsic religiosity score were all associated with decreases in overall function at follow-up.

Number of Bothersome Symptoms. In addition to having more bothersome symptoms at baseline, female sex, increase in alcohol use, greater baseline depressive symptomatology, and increase in depressive symptoms over time—but not veteran status—were all associated with increased number of bothersome symptoms at follow-up. Improvement in the health worries score; higher baseline financial worries score and improvement in the financial worries score; and positive change in nonorganized religious activity score were all associated with fewer bothersome symptoms at follow-up.

Health Ratings. In addition to higher baseline health ratings, higher baseline and improved overall function, improved financial worries score, a past history of AIDS-defining conditions, and increased in organized religious activity score were all associated with improvements in health ratings at follow-up. Increase in the number of bothersome symptoms was associated with lower health ratings at follow-up. Veteran status had no effect on change in health ratings.

SG. Although veteran status was not associated with change in SG values, higher baseline SG values, a past history of injection drug use, providing financial support for a child, improvement in provider trust score, a higher baseline and an improved self-esteem score, and an increase in nonorganized religious activity were all associated with increases in SG health values. More bothersome symptoms at baseline and an increase in the number of bothersome symptoms, as well as a higher baseline spirituality score, were all associated with decreases in SG values at follow-up.

Time Tradeoff. In addition to higher baseline TTO values, being heterosexual; having stable housing; having a religious affiliation; improved overall functioning at follow-up; being more risk-seeking; and having a higher level of spirituality at baseline were all associated with having higher TTO values at follow-up. More bothersome symptoms at baseline and an increase in number of bothersome symptoms were associated with lower TTO values at follow-up. Veteran status had no effect.

DISCUSSION

In this study, we assessed health status, health ratings, and health values in veterans and nonveterans with HIV infection twice over 12 to 18 months. We also assessed determinants of HRQoL and change in HRQoL over time.

We found that CD4 cell count and viral load were only associated with some of the HRQoL outcomes in bivariate analyses (with health status and health ratings but not with health

Table 4. Multivariable Correlates of Health-Related Quality of Life at Baseline

Outcome Measure	Significant Multivariable Predictors	β Coefficient	Standardized β Coefficient	*P* Value	Observations Used/Error Degrees of Freedom/Adjusted R^2
Overall function	Bothersome symptoms (0 to 5, higher score = more bothersome symptoms)	–1.25	–0.17	<.0001	431/420/0.53
	Depressive symptoms (0 to 30, higher score = more depressive symptoms)	–0.40	–0.12	.0276	
	Health worries (0 to 100, higher score = fewer worries)	0.24	0.27	<.0001	
	Financial worries (0 to 100, higher score = fewer worries)	0.10	0.15	.0009	
	Working*	6.22	0.13	.0003	
	College education*	–3.59	–0.08	.0310	
	HAART*	3.87	0.07	.0343	
	Duration of disease (years, higher number = longer duration)	–0.36	–0.08	.0163	
	Positive religious coping (7 to 28, higher score = greater positive religious coping)	–0.27	–0.07	.0312	
	Self-esteem (6 to 24, higher score = more self-esteem)	0.80	0.12	.0047	
Symptom bother	Overall function (0 to 100, higher score = better functioning)	–0.03	–0.25	<.0001	449/445/0.41
	Working*	–0.59	–0.09	.0179	
	Depressive symptoms (0–30, higher score = more depressive symptoms)	0.19	0.42	<.0001	
Health rating	Overall function (0 to 100, higher score = better functioning)	0.28	0.29	<.0001	433/423/0.45
	Bothersome symptoms (0 to 15, higher score = more bothersome symptoms)	–1.27	–0.19	<.0001	
	Depressive symptoms (0 to 30, higher score = more depressive symptoms)	–0.41	–0.13	.0264	
	Self-esteem (6 to 24, higher score = more self-esteem)	–0.67	–0.11	.0318	
	Spirituality (0 to 92, higher score = more spiritual)	0.29	0.26	<.0001	
	Stable housing*	6.67	0.08	.0255	
	History of AIDS-defining conditions*	–4.33	–0.10	.0085	
	Provider trust (0 to 100, higher score = more trust)	0.08	0.09	.0199	
	Risk attitude (6 to 36, higher score = more risk-seeking)	0.42	0.10	.0043	
Standard gamble	Veteran*	–6.91	–0.09	.0324	443/435/0.22
	Overall function (0 to 100, higher score = better functioning)	0.16	0.11	.0371	
	Bothersome symptoms (0 to 15, higher score = more bothersome symptoms)	–1.35	–0.16	.0019	
	Perceived social support (12 to 48, higher score = more perceived support)	0.51	0.14	.0042	
	Duration of disease (years, higher number = longer duration)	–0.60	–0.10	.0176	
	City (0 = other cities, 1 = Cincinnati)	–10.97	–0.19	<.0001	
	HIV mastery (0 to 100, higher score = greater comfort)	0.09	0.10	.0403	
Time tradeoff	Veteran*	–12.16	–0.17	<.0001	446/441/0.20
	Bothersome symptoms (0 to 15, higher score = more bothersome symptoms)	–2.29	–0.26	<.0001	
	Spirituality (0 to 92, higher score = more spiritual)	0.31	0.23	<.0001	
	Alcohol use (drinks/month, higher = more consumption)	–0.09	–0.09	.0309	

**0, absence of variable, 1, presence of variable.*
HAART, highly active antiretroviral therapy.

values), and, in multivariable analyses, with none of the HRQoL outcomes at baseline or follow-up. Other clinical factors, such as symptoms (HIV-related or depressive), and other indicators of disease severity, such as duration of disease and history of an AIDS-defining condition, were more consistently associated with HRQoL and may be more pertinent clinical indicators of HRQoL in the HAART era.

We found that HRQoL was stable, on average, over the 12 to 18 months of follow-up. Because at baseline the cohort had HIV for an average of more than 8 years, over 75% were being treated with HAART, and the mean CD4 cell count for the cohort was 420 cells/μL, one might expect little change in HRQoL, on average, over the relatively brief time assessed. That said, there was substantial interindividual variation, with some subjects improving and others worsening. Our analyses add to the understanding of what contributes to that change.

Although several studies have assessed HRQoL outcomes in veterans with HIV,[13,14,24,50] our study directly compared HRQoL in veterans and nonveterans as only one other study has done.[21] The authors of that study felt that the decrements in HRQoL for veterans could be related to differences in demographic and clinical factors such as age, employment, and CD4 cell counts, but they were unable to assess that hypothesis. Our study corroborates and expands upon that study, as we were able to account for differences in HRQoL via multivariable analyses: our finding that veterans reported significantly lower SG and TTO health values held true even after accounting for those and other differences in demographic and clinical characteristics. We speculate that those differences could be related to unmeasured differences in the cohorts, such as life experiences (i.e., military service) or literacy. Whatever the reason, the difference in health value results for vet-

Table 5. Multivariable Correlates of Health-Related Quality of Life at Follow-up

Outcome Measure	Significant Multivariable Predictors	β Coefficient	Standardized β Coefficient	*P* Value	Observations Used/Error Degrees of Freedom/ Adjusted R^2
Overall function	Baseline overall function score (higher score = better function)	0.35	0.36	<.0001	327/314/0.63
	Change in health worries score (positive number = fewer worries)	0.17	0.18	<.0001	
	Baseline financial worries score (higher score = fewer worries)	0.09	0.14	.0098	
	Change in financial worries score (positive number = fewer worries)	0.14	0.18	<.0001	
	Baseline depressive symptoms score (higher score = more symptoms)	–1.32	–0.41	<.0001	
	Change in depressive symptoms score (positive number = more symptoms)	–0.99	–0.23	<.0001	
	Working at baseline*	4.80	0.11	.0102	
	Working at follow-up (if did not work at baseline)*	5.37	0.09	.0175	
	Change in self-esteem score (positive number = more self-esteem)	0.64	0.08	.0263	
	Change in organized religious activity score (positive number = more activity)	1.69	0.08	.0187	
	Change in intrinsic religiosity score (positive number = more religiosity)	–1.16	–0.13	.0005	
	Change in positive religious coping score (positive number = greater positive religious coping)	0.43	0.08	.0329	
Symptom bother	Baseline number of bothersome symptoms (higher number = more symptoms)	0.50	0.48	<.0001	345/335/0.58
	Female sex*	1.20	0.12	.0006	
	Change in alcohol use (positive number = more use)	0.01	0.12	.0011	
	Change in health worries score (positive number = fewer worries)	–0.01	–0.08	.0454	
	Baseline financial worries score (higher score = fewer worries)	–0.01	–0.16	.0030	
	Change in financial worries score (positive number = fewer worries)	–0.01	–0.10	.0234	
	Baseline depressive symptoms score (higher score = more symptoms)	0.13	0.27	<.0001	
	Change in depressive symptoms score (positive number = more symptoms)	0.15	0.24	<.0001	
	Change in nonorganized religious activity score (positive number = more activity)	–0.18	–0.08	.0223	
Health rating	Baseline health rating (higher score = better rating)	0.42	0.41	<.0001	344/336/0.58
	Baseline overall function score (higher score = better function)	0.43	0.45	<.0001	
	Change in overall function score (positive number = better function)	0.43	0.43	<.0001	
	Change in financial worries score (positive number = fewer worries)	0.06	0.09	.0185	
	Change in number of bothersome symptoms (positive number = more symptoms)	–1.52	–0.19	<.0001	
	Past history of AIDS-defining conditions*	5.04	0.11	.0018	
	Change in organized religious activity score (positive number = more activity)	1.60	0.08	.0222	
Standard gamble	Baseline standard gamble value (higher score = greater value for current health)	0.25	0.26	<.0001	311/300/0.24
	Past history of injection drug use*	9.99	0.11	.0358	
	Financially supporting children*	9.69	0.13	.0133	
	Change in provider trust score (positive number = more trust)	0.10	0.12	.0225	
	Baseline number of bothersome symptoms (higher number = more symptoms)	–2.28	–0.24	.0001	
	Change in number of bothersome symptoms (positive number = more symptoms)	–2.86	–0.25	<.0001	
	Baseline self-esteem score (higher score = more self-esteem)	1.95	0.25	.0027	
	Change in self-esteem score (positive number = more self-esteem)	1.67	0.14	.0210	
	Change in nonorganized religious activity score (positive number = more activity)	3.04	0.15	.0040	
	Baseline spirituality score (higher score = more spiritual	–0.22	–0.16	.0290	
Time tradeoff	Baseline time tradeoff value (higher score = greater value for current health)	0.32	0.33	<.0001	343/333/0.38
	Heterosexual sexual orientation*	7.30	0.13	.0039	
	Having stable housing*	12.82	0.12	.0049	
	Having a religious affiliation*	6.76	0.11	.0186	
	Change in overall function score (positive number = better function)	0.15	0.12	.0072	

Table 5 (continued)

Outcome Measure	Significant Multivariable Predictors	β Coefficient	Standardized β Coefficient	P Value	Observations Used/Error Degrees of Freedom/ Adjusted R^2
	Baseline number of bothersome symptoms (higher number = more symptoms)	−2.26	−0.27	<.0001	
	Change in number of bothersome symptoms (positive number = more symptoms)	−1.73	−0.18	.0003	
	Baseline risk attitude (higher score = more risk seeking)	0.64	0.13	.0029	
	Baseline spirituality score (higher score = more spiritual)	0.14	0.10	.0417	

*0, absence of variable; 1, presence of variable.

erans and nonveterans might have policy implications. Specifically, the findings imply that health values used in cost-effectiveness analyses focusing on veteran populations (i.e., conducted from the perspective of the VHA) may need to be derived directly from veterans and that health values derived in studies of veterans may not be generalizable to nonveteran populations with HIV/AIDS, especially if they are not specifically evaluating change over time.

We were able to identify several interesting associations with HRQoL or with changes in HRQoL that could potentially be targets for interventions to improve HRQoL. Levels of spirituality/religiosity were associated with all baseline and follow-up HRQoL outcomes except for symptom bother at Time 1. Baseline level of spirituality was associated with TTO values both at baseline and follow-up, possibly implying that people with higher levels of spirituality may be less willing to trade time. Interestingly, change in positive religious coping and religious activity (organized and nonorganized) were consistently shown to relate to HRQoL outcomes (health status, health ratings, and health values) at follow-up. While we do not conclude that spirituality/religiosity affects HIV disease directly, its consistent association with HRQoL and change in HRQoL over time may represent a role of spirituality/religiosity in adaptation to HIV disease. Additionally, although there have been several studies that have elucidated the impact of symptoms on health status in patients with chronic viral illnesses,[13–15,23,32] limited information exists on the impact of symptoms on health values,[51] and our study adds new insights on that relationship.

The statistical significance of symptom bother (and/or change in symptom bother) in the multivariable models emphasizes the importance of better understanding the impact of symptoms and of the need to explore the association of specific symptoms with HRQoL. If certain specific symptoms are strongly associated with HRQoL or with change in HRQoL, then perhaps those key symptoms could be targets of interventions. Also, we found that depressive symptoms and change in the depressive symptoms score are significantly correlated with change in health status (functional status and symptom bother) and health ratings. The importance of depressive symptoms vis-à-vis health status in patients with HIV has been noted previously,[23,26] and our results support identifying and treating depression in patients with HIV to improve their HRQoL. Health worries and/or financial worries were associated with change in overall function, symptom bother, and health ratings. Patients' concerns regarding their health and finances have not typically been part of most generic or HIV-specific quality of life assessments; however, our findings would support their validity as well as the need to include them in future HRQoL studies in HIV/AIDS.

This study had several strengths and limitations. Strengths included having 4 study sites, including both veterans and nonveterans, having a large sample (ours is the largest study of directly derived health values in subjects with HIV), and including a number of unique potential determinants of HRQoL. Limitations relate to the generalizability. The subjects in this study were recruited from tertiary care sites in 3 cities and Hispanics, women, and active drug users were under-represented; therefore, our results may not be generalizable to all patients receiving (or not receiving) care for HIV. Also, we were only able to report associations with HRQoL without knowing the direction of the association (i.e., whether the factor drove the HRQoL level or the HRQoL level drove the factor).

In conclusion, veterans with HIV have significantly poorer HRQoL than nonveterans, but when controlling for other factors, veteran status is only a significant determinant of health values. A number of correlates of HRQoL, such as symptom bother, spirituality/religiosity, depressive symptoms, health worries, and financial worries could be fruitful targets for interventions to improve HRQoL in patients with HIV/AIDS.

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