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# The use of two measures of health-related quality of life in HIV-infected individuals: a cross-sectional comparison

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**Two measures of health-related quality of life in 65 HIV-infected individuals were compared in a cross-sectional design. The Quality of Well-Being Scale (QWB) results in a single score ranging from death to perfect health. The MOS-HIV Health Survey (MOS-HIV, 34-item version) gives scores in 11 dimensions. The QWB score distinguished subjects with AIDS from those who were asymptomatic ($p$=0.027). For the seven multi-item scales of the MOS-HIV, Cronbach's alpha ranged from 0.85–0.95, indicating good internal consistency reliability. Clinical HIV-infection status was significantly associated with the dimensions of Overall Health ($p$=0.002), Role Function ($p$=0.022), Social Function ($p$=0.037), Energy/Fatigue ($p$=0.027) and Health Distress ($p$=0.025). All eleven dimensions of the MOS-HIV were significantly correlated with the QWB score (Spearman's coefficient=0.405–0.670; for all, $p$<0.01) and the QWB score could be predicted from the MOS-HIV dimension scores using multiple regression. The QWB and the MOS-HIV may be useful in assessing health-related quality of life in patients infected with HIV.**

*Key words:* Acquired Immunodeficiency Syndrome; health status; HIV-infection; quality of life; questionnaires.

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## Introduction

Infection with HIV causes progressive immunodeficiency resulting in a variety of opportunistic processes which occur over a period of time often longer than a decade.[1] Unfortunately, no cure for HIV-infection has been found and therapy directed at the virus has not been shown consistently to prolong life.[2,3] Because of this, HIV-infection may be viewed as a chronic, debilitating condition where the well-being and functional abilities of a patient may be as important as longevity. In this context, measures of health-related quality of life (HRQOL) may come to play as important a role in the management of HIV-infected patients as conventional measures of outcome and immune function that have been used to monitor the course of the disease.[4,5]

Several studies have examined HRQOL among individuals infected with HIV through the use of a variety of previously developed instruments.[6–13] However, there have been few published comparisons of different instruments.[14,15]

Current efforts to assess HRQOL generally consist of either a single global score or a profile of scores representing various dimensions of health. The Quality of Well-Being Scale (QWB) is an example of the first approach.[8] Patient responses to a branching series of questions regarding morbidity and mortality are recorded by a trained interviewer. These responses define the degree of functioning and symptom severity of the subject and results are expressed as a single score. The QWB has been validated in numerous studies of subjects without HIV-infection[8,16,17] and has been found to correlate with Karnofsky Performance Status scores in patients infected with HIV.[18]

Presentation of results in a single scale is sometimes very desirable, particularly for cost-effectiveness

analysis. However, as administration requires a trained interviewer, the QWB has not been widely used in AIDS clinical trials. The Medical Outcomes Study (MOS) HIV Health Survey is a brief, self-administered, comprehensive collection of short scales that asks patients to describe important aspects of their health. Results are given as a profile scores. This and closely related questionnaires have been widely used in HIV-infected populations.[6,11-13] In general, these instruments have shown construct validity and correlate well with conceptually-related variables and known differences in clinical states.

In the present study, we used the QWB and a 34-item version of the MOS-HIV to measure HRQOL in a cross-sectional sample of subjects receiving care in a single HIV clinic. The purpose of the study was to compare the construct validity of these two instruments with regard to other measures of HIV-related health status. We hypothesized that both instruments would be associated with the clinical HIV-infection status as well as with each other. A second goal was to develop a model to predict QWB scores from MOS-HIV subscale scores.

## Methods

Subjects were adults with documented HIV-infection recruited from the Infectious Disease Clinic at the Veterans Affairs Medical Center in Tucson, Arizona. Subjects were excluded from the study if they were acutely ill or were hospitalized. The QWB and the MOS-HIV were administered to each subject on the same day in a controlled environment.

The QWB was administered by a trained interviewer. The responses of each subject were transformed to a QWB scale score, ranging from 0.0 (indicating death) to 1.0 (indicating a completely asymptomatic, optimally functioning state) using a preference-weighting formula previously described.[8]

The Medical Outcomes Study HIV Health Survey (MOS-HIV)[12] is a 30-item self-administered questionnaire which includes scales and items to assess the patient's own reports and ratings of eleven dimensions of health-related functioning and well-being. For this study, it was supplemented with four additional general health perception items to improve reliability of this subscale.[19] Subjects responded to closed-ended items with categorical rating scales. For each of the eleven dimensions measured, responses to items were converted to a 0–100 scale, summed, then divided by the number of items in the dimension.

Concurrent data included current antiretroviral drug therapy, taken for at least one month, and CD4 lymphocyte count/μl, obtained within the last three months. The Karnofsky Performance Status score[20] was assessed by a single trained individual in the clinic. The clinical HIV-infection status of the subject was composed of three categories. The category of AIDS was designated without relation to CD4 lymphocyte count according to clinical criteria established by the Centers for Disease Control.[21] The subject was assigned to the symptomatic category if none of the AIDS-defining criteria were met but constitutional symptoms, oropharyngeal candidiasis, fever >38.5° C, or diarrhea for longer than one month were reported. The asymptomatic category was assigned to subjects who did not meet criteria for either AIDS or the symptomatic categories as defined above.

We hypothesized that both the QWB score and the MOS-HIV scale scores would be positively associated with clinical HIV-infection status, CD4 lymphocyte count, Karnofsky score and receipt of antiretroviral therapy. We also hypothesized that there would be a significant association between the QWB score and the MOS-HIV scale scores.

Cronbach's α was calculated to estimate the internal consistency of the seven multi-item scales of the MOS-HIV.[19,22] Other analyses were performed using Statview® 4.01 (Abacus Concepts, Berkeley, CA, USA). Summary data were expressed as median and 25–75% interquartile range. The Kruskal–Wallis test was used to compare continuous variables in non-paired groups. The Mann–Whitney U test was used for paired tests. For determination of correlation, the Spearman's ρ was employed to test associations[23] and the *F*-test was used to compare QWB scores and categories of clinical HIV-infection status.[24] In all cases, a 2-tailed *p*-value of $<0.05$ was considered to be statistically significant.

We used multiple linear regression to estimate the QWB score from the dimension scores of the MOS-HIV. The percent availability in the QWB score accounted for by each dimension of the MOS-HIV was determined by multiplying the correlation coefficient by the standard regression coefficient of the dimension and QWB scores.[23]

## Results

Characteristics of the 65 subjects are shown in Table 1. In general, the subjects were largely white, middle-aged, homosexual men receiving antiretroviral therapy. Cronbach's α for the seven multi-item scales of the MOS-HIV ranged from 0.85 (for Physical Function) to 0.95 (for Mental Health) indicating good internal

**Table 1.** Clinical characteristics of the 65 subjects in the study.

| | Median | Interquartile range* |
|---|---|---|
| Age (years) | 41 | 36–46 |
| CD4 lymphocyte count/μl | 180 | 88–387 |
| Karnofsky score | 90 | 80–100 |

| *Antiretroviral treatment* | Number |
|---|---|
| Zidovudine | 24 |
| None | 23 |
| Didanosine | 13 |
| Stavudine | 2 |
| Zidovudine + Didanosine | 2 |
| Zalcitabine | 1 |
| *Sex* | |
| Male | 64 |
| Female | 1 |
| *Clinical Status* | |
| Asymtomatic | 27 |
| Symptomatic | 19 |
| AIDS | 19 |
| *Race* | |
| White | 59 |
| Black | 4 |
| Hispanic | 2 |
| *HIV-risk* | |
| Homosexual/Bisexual | 45 |
| Injecting drug use | 12 |
| Both of the above | 6 |
| Transfusion | 1 |
| Heterosexual | 1 |

*25–75% interquartile range

consistency reliability. The median QWB score for the 65 subjects was 0.593 (interquartile range from 0.538–0.700) with a minimum of 0.421 and a maximum of 0.885. The median interquartile scores, and the number of subjects scoring at the minimum and maximum of the 11 dimensions of the MOS-HIV are shown in Table 2. Scores from each of the dimensions were significantly correlated with the QWB score (Table 2).

The QWB score was compared to several clinical features of the subjects. There was a trend toward increasing scores for subjects who were clinically less ill (Table 3), and the median score for subjects with AIDS was significantly higher than for asymptomatic subjects ($F$-test=0.371, $p$=0.027). There were no significant correlations between the QWB scores and either CD4 lymphocyte count/μl (Spearman's $\rho$=0.043, $p$=0.735) or Karnofsky score (Spearman's $\rho$=0.220, $p$=0.136). The median QWB score for those subjects receiving no antiretroviral therapy was 0.563 (interquartile range=0.523–0.636), lower but not significantly different from 0.599 (0.550–0.708) for those receiving any type of antiretroviral drug therapy ($F$-test=1.416, $p$=0.358).

For the MOS-HIV, five dimensions were significantly associated with the clinical HIV-infection status of the subject (Table 3). Overall Health, Physical Function and Role Function were significantly associated with the Karnofsky score (Spearman's $\rho$=0.29096;0.310; for all, $p$<0.05). Scale scores were not significantly associated with the CD4 lymphocyte count/μl or with receipt of any type of antiretroviral drug therapy.

The QWB score was estimated from the dimensions

**Table 2.** MOS-HIV dimension scores and correlations with the QWB score ($n$=65).

| MOS-HIV Dimension | Number | | | Median | Range† | Spearman coefficient | $p$-value |
|---|---|---|---|---|---|---|---|
| | Total* | % at 0 | % at 100 | | | | |
| Overall Health | 63 | 3.2 | 4.6 | 30 | 15–65 | .541 | <0.0001 |
| Physical Function | 65 | 7.7 | 29.2 | 67 | 33–100 | .659 | <0.0001 |
| Role Function | 65 | 49.2 | 40.0 | 50 | 0–100 | .670 | <0.0001 |
| Social Function | 65 | 1.5 | 41.5 | 80 | 60–100 | .650 | <0.0001 |
| Cognitive Function | 64 | 1.6 | 23.4 | 80 | 60–95 | .586 | <0.0001 |
| Pain | 64 | 12.5 | 18.8 | 60 | 40–80 | .522 | <0.0001 |
| Mental Health | 65 | 1.5 | 7.7 | 72 | 48–88 | .526 | <0.0001 |
| Energy/Fatigue | 65 | 3.1 | 3.1 | 50 | 34–70 | .665 | <0.0001 |
| Health Distress | 65 | 6.2 | 23.1 | 75 | 49–91 | .470 | 0.0002 |
| Quality of Life | 65 | 4.6 | 10.8 | 75 | 50–75 | .580 | <0.0001 |
| Health Transition | 65 | 4.6 | 7.0 | 50 | 50 | .405 | 0.0068 |

**Table 3.** Associations between the QWB score and the MOS-HIV dimension scores and the clinical HIV-infection status of the subjects, defined as AIDS, symptomatic or asymptomatic. Number of subjects scored for each dimension are shown in Table 2.

| | Median scores | | | *p*-value |
|---|---|---|---|---|
| | AIDS | Symptomatic | Asymptomatic | |
| QWB | 0.579 | 0.590 | 0.623 | 0.198 |
| MOS-HIV Dimension | | | | |
| Overall Health | 20 | 30 | 60 | 0.002* |
| Physical Function | 67 | 50 | 83 | 0.064 |
| Role Function | 0 | 0 | 100 | 0.022* |
| Social Function | 60 | 80 | 100 | 0.037* |
| Cognitive Function | 90 | 65 | 90 | 0.373 |
| Pain | 60 | 40 | 60 | 0.062 |
| Mental Health | 68 | 60 | 76 | 0.593 |
| Energy/Fatigue | 50 | 40 | 70 | 0.027* |
| Health Distress | 75 | 75 | 90 | 0.025* |
| Quality of Life | 50 | 50 | 75 | 0.369 |
| Health Transition | 50 | 50 | 50 | 0.422 |

* *p*-value <0.05 by Kruskal–Wallis test

**Table 4.** Multiple regression analysis comparing the QWB score to the 11 dimension scores of the MOS-HIV.

| MOS-HIV | Coefficient | *p*-value |
|---|---|---|
| Overall Health | 0.115 | 0.015 |
| Physical Function | 0.011 | 0.803 |
| Role Function | 0.048 | 0.086 |
| Social Function | 0.055 | 0.331 |
| Cognitive Function | 0.066 | 0.210 |
| Pain | 0.104 | 0.023 |
| Mental Health | 0.015 | 0.824 |
| Energy/Fatigue | 0.058 | 0.438 |
| Health Distress | -0.029 | 0.501 |
| Quality of Life | 0.019 | 0.762 |
| Health Transition | -0.070 | 0.143 |

* *p*-value <0.05 by Kruskal–Wallis test

of the MOS-HIV using multiple regression analysis.[25] The coefficients and *p*-values for each score are shown in Table 4. Eighty per cent of the variance of the QWB score could be predicted from a regression equation using nine dimensions scores, expressed as QWB score × 100 = 39.8 + 0.115 × (Overall Health) = 0.104 × (Pain) + 0.048 × (Role Function) + 0.055 × (Social Function) + 0.058 × (Energy/Fatigue) + 0.066 × (Cognitive Function) + 0.019 × (Quality of Life) + 0.011 × (Physical Function) + 0.015 × (Mental Health); adjusted $r^2 = 0.670$. Two dimensions, Overall Health and Pain, were significant predictors of the variance in the QWB score (for both, $p<0.025$, Table 4) and together accounted for 34.4% if the QWB score variance.

## Discussion

This study provides further evidence for the reliability of the MOS-HIV and its construct validity when compared to clinical disease stage. Scores were similar to those found by Wachtel and colleagues using a 20-item version of the MOS health ratings.[11] The Cronbach's alphas seen for all multi-item dimensions suggest good reliability for this health-related quality of life instrument in this patient sample. As expected, the QWB scale score was significantly associated with the MOS-HIV dimension scores and was also associated with the clinical HIV-infection status of the subject.

The QWB was designed as a measure of general health functioning and well-being. It is not disease-specific and results should be applicable to a wide variety of diseases and patient populations.[17] However, it may lack some of the discriminative ability of an instrument which uses multiple scales, such as the MOS-HIV.[26] On the other hand, the QWB has certain advantages. It combines information on

morbidity and mortality into a single score. As binary decisions are often needed in practice and policy-making, the availability of a single number simplifies decision-making and analysis. In addition, a single score is helpful for deriving quality-adjusted-life-years (QALYs).

Because of ease of administration and accumulated evidence of reliability and validity in HIV-infected populations, the MOS-based measures are widely used in HIV clinical trials. The profile of scores comprised by the MOS-HIV are most useful where study questions concern detailed descriptions of patients, as in a cohort study of epidemiological survey. Profiles of scores may also be useful to describe the effects of drugs. We found that it is possible to explain a substantial proportion of the QWB score from dimension scores of the MOS-HIV. Our results are similar to those of Fryback and colleagues, who used SF-36 scores to impute QWB scores.[25] If our estimates of coefficients are as robust in other groups of patients, this method may prove useful in generating QALYs from studies using psychometrically-based questionnaires.

Although the MOS health ratings and the QWB were originally developed as general measures of HRQOL,[26] our findings support their use in assessing the clinical course of patients infected with HIV. The fact that the MOS-HIV can be self-administered in 5–10 minutes makes it particularly attractive for use in the clinical setting.[24] The profile of scores offered by the MOS-HIV and other related instruments may be useful in those instances where descriptions of patients' responses are needed. On the other hand, a single, global score of HRQOL, as provided by the QWB, may be required when examining the cost-effectiveness of a particular drug therapy. Future studies will be required to further define the usefulness of both of these instruments and to confirm the validity of imputing QWB scores from multi-dimensional measure.

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