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EFFECTS OF LIVER DISEASE ON THE WELL-BEING OF PERSONS LIVING WITH HIV

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Abstract

Clinical evidence suggests that patients with liver disease and HIV have poorer quality of life (QOL). Because little research exists to support this observation, this study examined the relationships between people with HIV and liver disorders and their QOL. Cella's multidimensional (functional, social, emotional, physical) conceptualization of QOL guided this study. The sample included 80 participants with liver disorders and HIV; 48.8% had chronic or permanent hepatitis. Cella's 4 dimensions significantly correlated with QOL: functional, $r = .329, p < .01$; social, $r = .636, p < .01$; emotional, $r = -.549, p < .01$; and physical, $r = -.480, p < .01$. Linear regression analysis with QOL as the dependent variable and the 4 dimensions as predictors resulted in significant associations explaining approximately 50% of the variance ($R^2 = .532$). Confirmatory factor analysis supported Cella's model with the 4 sub-domains loading on 1 factor (QOL). Understanding the multiple dimensions of QOL may assist in developing interventions for patients with HIV and co-morbid liver disorders.

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Clinical Considerations

- As persons with HIV are living longer, they are more likely to have co-morbid liver disease.
- Quality of life is a subjective phenomenon that is defined by the individual and requires a multi-dimensional assessment to be properly assessed.
- There is evidence that persons living with HIV and liver disease may have a poor quality of life.

Keywords

HIV; liver disease; quality of life; well-being

Persons with HIV are living longer and, therefore, are more likely to suffer significant co-morbidities due to liver disease (e.g., anemia, infectious hepatitis, lipodystrophy, and hepatocellular carcinoma), many of which may ultimately result in significant morbidity or mortality (Tedaldi et al., 2003). Both HIV and liver disease have been shown to have a significant effect on one's quality of life (QOL) (Fleming et al., 2004; Foster, Goldin, & Thomas, 1998; Hickman et al., 2004; Nicholas, Kirksey, Corless, & Kemppainen, 2005; Pojoga et al., 2004). Research suggests that persons living with HIV and liver disease (HIV+LD), a growing number of individuals (Kim, 2002; Thomas, 2006), may have a poorer QOL than persons with HIV who do not have liver disease (Tsui, Bangsberg, Ragland, Hall, & Riley, 2007). With no cure for HIV, persons living with HIV+LD are no longer just trying to survive day to day; they are instead seeing the future of living with HIV as a chronic disease with debilitating long-term consequences. The challenge for researchers and practitioners is to determine what aspects of QOL are affected when individuals live with multiple co-morbid conditions. Few theory-driven studies have explored testing QOL models in persons living with HIV+LD (Fleming et al., 2004). Thus, this study examined the use of Cella's (1994) conceptualization of QOL in persons living with HIV+LD.

The purpose of this study was to examine the relationships among the Cella's four domains (functional, social, physical, and emotional well-being) and overall QOL and to test the goodness-of-fit of Cella's model in a sub-sample of persons with HIV+LD. A study using Cella's (1994) model in persons with HIV+LD was not yet available; therefore, this study assessed the totality of the components that influence a potentially curable population (liver disease) with a population who lives with the chronic condition of HIV (Wilson, Hutchinson, & Holzemer, 1997).

Cella's Conceptualization

Cella's (1994) conceptualization of quality of life (QOL) was empirically tested in a sample ($n = 80$) of persons living with HIV+LD. Cella conceptualized overall QOL, or perceived well-being, as being comprised of four domains: functional, social, physical, and emotional well-being. Cella's model was chosen to be tested in a subgroup of persons with HIV+LD because it had been previously applied to hepatocellular carcinoma populations. Additionally, Cella's model had been applied to other specific diseases including, but not limited to, many cancers (breast, bladder, brain, colorectal, central nervous system, cervical, esophageal, endometrial, head and neck, hepatobiliary, lung, leukemia, lymphoma, ovarian, and prostate) and symptoms (fatigue, anemia, neutropenia, incontinence, lymphedema, and cachexia) (Cella, 2004). A possible pictorial representation of Cella's model consists of overlapping circles within the larger circle of QOL (see Figure 1). Each domain contributes to overall QOL and is subjective or self-perceived in nature.

The domain of functional well-being was defined by Cella as the subjective perspective regarding one's ability to perform daily tasks or activities of daily living. This domain could also be related to roles at work or with family or friends. Specifically, Cella defined this domain as it pertained to "one's personal needs, ambitions, or social role(s)" (Cella, 1994, p. 188). The domain of social well-being encompasses social support, close relations with family or friends, and intimacy. The domain of physical well-being pertains to individuals' perceptions of their own bodily functions, including disease symptomatology, side effects of medications, or general physical well-being. The last domain is emotional well-being. This domain was defined

by Cella as being bipolar with both positive and negative affect relations. The emotional well-being domain could include, but would not be limited to, optimism, depression, or anxiety. Overall QOL was defined as one's self-perceived overall well-being. The domains of importance that predict overall QOL in one patient population may not necessarily be the same as those of another population. All domains of QOL within Cella's conceptualization (functional, social, physical, and emotional) comprise the person's perceived QOL status. Thus, the domains have the potential to directly influence the individual's overall QOL.

There are multiple interpretations and conceptual frameworks for QOL, most of which consider QOL to be a multidimensional phenomenon in which the components make up the whole, similar to Cella's model (1994). QOL measures have been used in many settings and disease processes as noted previously. Being able to quantify QOL outcomes is of great interest to many researchers because it is important to be able to explain whether different treatments or interventions positively affect the patient's overall QOL.

Design

This cross-sectional secondary data analysis assessed QOL of persons living with HIV and co-morbid LD who were recruited to a parent study (NINR 1R01 NR047491, Primary Investigator: Judith A. Erlen) designed to improve medication adherence in persons living with HIV who were taking highly active antiretroviral medication. Exempt institutional review board authorization was gained prior to initiation of the study. Data were extracted by the study's data manager, and participant personal health information was de-identified. Chart review for clinical indicators of liver co-morbidities was performed. The particular liver disease was not always known because those data were not systematically collected as part of the parent study.

Participants

The parent study included individuals with a diagnosis of HIV currently being treated with highly active antiretroviral medication who were males and females of all races and ethnicities and who had telephone access. Exclusion criteria were failure on the HIV Dementia Scale (Power, Selnes, Grim, & McArthur, 1995), currently incarcerated, living with someone already in the study, or not presently administering one's own medications.

This secondary data analysis included 80 persons with HIV+LD who were predominately male (70%) and Caucasian (63.8%); 48.8% had chronic or permanent hepatitis. The average age was 40.95 ± 7.03 years, and the average number of years of education was 13.01 ± 2.77 .

Measures

Functional well-being—Functional well-being was measured with the Medical Outcomes Study HIV Health Survey (MOS-HIV) role function subscale (MOSRF) from the version of the MOS SF-36 (Ware, Snow, Kosinski, & Gandek, 1993) adapted for the HIV population (Wu et al., 1991). Likert responses to questions vary from *all the time* to *none of the time* (Wu, Revicki, Jacobson, & Malitz, 1997). The 100-item subscale scores range from 0–100, with higher scores signifying better function. The MOSRF has a Cronbach's alpha of .50 ($n = 117$, HIV)(Wu et al., 1997).

Social well-being—The Interpersonal Support Evaluation List (ISEL) was used to measure social support as an indicator of the social domain. The ISEL is a Likert instrument that asks participants to subjectively rate the support they receive from others as *definitely false* (0) to *definitely true*(3). There are 40 items: 20 true and 20 false. Higher scores correspond to higher perceived social support. Cohen, Mermelstein, Kamarck, and Hoberman (1985) have reported Cronbach's alphas of .88–.90 in healthy adults ($n = 64$) without chronic disorders.

Physical well-being—Physical well-being was evaluated using the Symptom Distress Scale (SDS), a reliable instrument that assesses 13 particular symptoms in persons living with HIV (Ragsdale & Morrow, 1990). Each of the 13 Likert-like items may be ranked 1 to 5 (1 = *no distress* to 5 = *severe distress*); the higher the score, the more distress one is experiencing. Ragsdale and Morrow (1990) report a Cronbach's alpha of .92 in patients with HIV ($n = 95$).

Emotional well-being—The Beck Depression Inventory II (BDI-II) (Beck, Steer, & Brown, 1996), used to assess the emotional domain of QOL, is a 21-item ordinal tool for which each question has 4 statements ordered according to depressive symptom severity (maximum score is 63). Higher scores indicate more depressive symptoms. The BDI-II has a Cronbach's alpha of .92 in psychiatric outpatients ($n = 500$) (Beck et al., 1996).

Overall quality of life—The Ferrans and Powers (1992) Quality of Life Index (QLI) was used to assess overall QOL. The QLI assesses both importance and satisfaction with life. The total scale of this 66-item instrument has been shown to have a Cronbach's alpha of .84 in the HIV population (Mellors, Riley, & Erlen, 1997).

Analysis

Data analysis included univariate descriptive statistics, raw correlations, and multiple linear regression tests. Multiple regression analysis treated overall QOL as the dependent variable and the four domains of QOL as potential predictors. Confirmatory factor analysis was preformed to test the goodness-of-fit of the data to the Cella model (1994). Statistical significance was set *a priori* at .05 (two-tailed). SPSS version 13.0 (SPSS Inc., Chicago, Illinois) was used to manage and analyze the data. Confirmatory factor analysis was performed with EQS software package version 6.1 (Multivariate Software, Inc., Encino, California).

Results

All four domains were moderately associated with each other, with correlations ranging from .303 to .651 and appropriate negative correlations observed for inversely related domains (see Table 1). For example, BDI-II scores were negatively associated with ISEL scores, suggesting that greater depressive symptomatology corresponded to lower self-perceived social support. Similarly, higher SDS scores were negatively related to MOSRF scores, indicating that more self-reported symptoms were associated with perceptions of diminished role function ability (see Figure 2). Figure 2 depicts the bi-directional relationships between all the measures in Cella's model.

Standard multiple regression analysis revealed that the emotional, social, and physical domains were significant predictors that explained approximately 50% of the variance of QLI ($R^2 = .532$) (see Figure 2). Cella's domains were significantly associated with overall QOL as measured by the QLI: functional (MOSRF), $r = .329, p < .01$; social (ISEL), $r = .636, p < .01$; emotional (BDI-II), $r = -.549, p < .01$; and physical (SDS), $r = -.480, p < .01$ (see Table 1). However, the functional domain, as measured by the MOSRF subscale made no unique contribution to the regression model (see Table 2).

The description of Cella's conceptualization of QOL (1994) suggests a second order factor called QOL, which underlies the well-being domains. Standard multiple regression analyses demonstrated that the well-being domains predicted overall QOL, suggesting that the use of the QLI was valid in this sample. However, this analysis did not directly test Cella's hypothesis that all the domains make up the totality of QOL. Therefore, a confirmatory factor analysis was performed based on the correlations among the domains (MOSRF, ISEL, SDS, and BDI-II), all loading on one factor (overall QOL as measured by the QLI). A model in structural equation modeling was evaluated using exact and approximate test statistics.

A model chi-square tests a difference in an observed and a model covariance matrix. If the relationships among the variables are correctly explained then the chi-square should not be significant. Unfortunately, a model chi-square has been shown to be sensitive to sample size. And therefore, fit indexes have been developed. A fit index is similar to an effect size measure. Fit indexes are classified into absolute and approximate fit indexes. Hu and Bentler (1999) recommend that at least one fit index from each type be reported to evaluate a model fit. Comparative fit index (CFI) is the most popular incremental fit index (Bentler, 1990). CFI ranges from 0 to 1, and higher numbers indicate a better fit. A model with a CFI value of .95 or greater is considered a good fit. Goodness-of-fit index (GFI) is an absolute fit index (Joreskog & Sorbom, 1984). Its value ranges from 0 to 1 (but it can be smaller than 0). A model with a value of .90 or greater is considered to be a good fit. Standardized root-mean square residual (SRMR) is a residual-based absolute fit index that has been shown to be less sensitive to a sample size (Bentler, 1995; Hu & Bentler, 1998, 1999). A value of .08 or lower is considered a good fit.

All 4 factor loadings were significant (see Table 3), ranging in magnitude from .522 to .829. The overall model fit was good even though the model chi-square was significant, $\chi^2(2) = 7.591$, $p = .022$; CFI = .939, GFI = .956, SRMR = .058. The communalities ranged from .272 for ISEL to .687 for MOSRF. The QOL domain as measured by the QLI had good reliability with Cronbach's alpha = .783. A *priori* power study was computed using G*Power (Faul, Erdfelder, Lang, & Buchner, 2007). For a large effect (Cohen's $f^2 = .35$, $R^2 = .259$) with 5 predictors, a total of 43 subjects are required to detect a power of .80 at alpha .05. Ninety-two subjects are required to detect a medium effect (Cohen's $f^2 = .15$, $R^2 = .130$) with power of .80 at alpha .05.

Discussion

The results of this study supported the Cella Model (1994); however the functional and physical domains were highly correlated in the sample of persons with HIV+LD studies, consistent with the findings of a study by Wu et al. (1991). Role function was weakly associated with physical function but did not act as a predictor of overall QOL, and self-reported role function was not a predictor of overall QOL. These findings may have been due to individuals with HIV+LD viewing themselves as not having a social or working role, as more than 70% were unemployed or disabled. The MOSRF demonstrated a Cronbach's alpha = .50 in this sample, suggesting that this particular tool may not be appropriate for this population or the use of a subscale of the MOS-HIV is not as reliable as using the MOS-HIV summary scales. The results do not, however, refute Cella's model (1994), as he does not speculate on the level of association between the two domains but only claims that the domains are related. The findings of this study supported that claim.

Perceptions of the quality of one's life with HIV and liver disease and perceptions regarding day-to-day functioning and fulfillment of life roles may differ. Likewise, everyday functioning may be very different from fulfillment of specific roles. Functional well-being is an antecedent to functional status (Fawcett, 1999), in that well-being is how persons perceive themselves overall compared to their current perceived state of health (status). Functional status is important because better understanding of the factors that directly affect an individual's ability to function in daily life could guide implicit and explicit supportive care. While Cella's model (1994) did show a good prediction of QOL based on three of the four domains, functional status dropped out of the regression model.

Limitations of this study included the retrospective nature of the study with QOL measures that were predetermined and a relatively small sample size. The type and cause of liver disease was not known in this sample of persons living with co-morbid HIV. Additionally, a more

sensitive or specific measure of liver disease, symptomatology, and a more reliable measure of role function may have improved this study. Future research is warranted with potentially different measures of the functional domain.

Supporting persons with HIV+LD in achieving the life they desire is difficult if all that is known is that their QOL has decreased. Understanding what is most important to individuals and their overall well-being within these domains may hold the key to potential interventions. Physical well-being is an antecedent to physical status, and physical status can be highly related to particular health and physical symptoms associated with chronic and co-morbid conditions. Therefore, future research needs to continue to include disease-specific symptoms and symptom severity in order to further assess the phenomenon of QOL within the population of individuals with co-morbid HIV+LD.

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Figure 1. Pictorial representation of Cella's Model (1994)

$$R^2 = .53$$

Figure 2. Correlations within operationalized Cella Quality of Life Model

Note. Relationships of overall QOL as measured by the QLI with functional well-being (MOSRF); social well-being (ISEL); physical well-being (SDS); and emotional well-being (BDI-II); QLI = Quality of Life Index; MOSRF = Medical Outcomes Survey HIV Role Function Subscale; ISEL = Interpersonal Support Evaluation List; SDS = Symptom Distress Scale; and BDI-II = Beck Depression Inventory II.

Table 1

Correlational Matrix of Measures

Measure	QLI	MOSRF	ISEL	SDS	BDI-II
QLI	1.000				
MOSRF	.552	1.000			
ISEL	.629	.430	1.000		
SDS	-.470	-.651	-.303	1.000	
BDI-II	-.497	-.494	-.486	.482	1.000

Note. QLI = Quality of Life Index; MOSRF = Medical Outcomes Survey HIV Role Function Subscale; ISEL = Interpersonal Support Evaluation List; SDS = Symptom Distress Scale; and BDI-II = Beck Depression Inventory II.

Table 2

Regression Analysis Summary for Measures Predicting Quality of Life (N = 80)

Measure	<i>B</i>	<i>SE B</i>	<i>p</i>	partial r^2
QLI ^a	14.450	4.30	.001	-
MOSRF	.440	.63	.490	.003
ISEL	.125	.03	.001	.161
SDS	-.170	.08	.040	.028
BDI-II	-.140	.07	.040	.028

Note. $R^2 = .53$. QLI^a = Constant; QLII = Quality of Life Index; MOSRF = Medical Outcomes Survey HIV Role Function Subscale; ISEL = Interpersonal Support Evaluation List; SDS = Symptom Distress Scale; and BDI-II = Beck Depression Inventory II.

Table 3

Confirmatory Factor Analysis

Measure QLI ^a	Factor loading	z-value	SE
MOSRF	.829	7.784	.107
ISEL	.522	4.525	.115
SDS	.754	6.972	.108
BDI-II	.643	5.788	.111

Note. $\chi^2 (2) = 7.591, p = .022$; CFI = .939, GFI = .956, SRMR = .058. QLI^a = Constant; QLI = Quality of Life Index; MOSRF = Medical Outcomes Survey HIV Role Function Subscale; ISEL = Interpersonal Support Evaluation List; SDS = Symptom Distress Scale; and BDI-II = Beck Depression Inventory II.