

Is Model for End-Stage Liver Disease score associated with quality of life after liver transplantation?

Context—The Model for End-Stage Liver Disease (MELD) is used to predict short-term mortality of patients on the liver transplant waiting list and to allocate deceased donor livers for transplantation.

Objective—To examine the relationship between MELD score before transplant and quality of life and other functional status indicators after transplant.

Design, Setting, and Patients—Two-hundred sixty-five adults from 2 transplant programs completed quality-of-life measures 1 year after transplantation. A subcohort ($n = 115$) also completed quality-of-life assessments before transplant. Clinical parameters at the time of transplantation were collected from their medical records.

Main Outcome Measures—Short Form-36 Health Survey, version 2; Transplant Symptom Frequency Questionnaire.

Results—Patients with MELD scores greater than 25 at transplantation had significantly higher scores on the Short Form-36 general health ($P = .004$) and physical component summary ($P = .02$) than did patients with MELD scores of 25 or less. However, scores on the Transplant Symptom Frequency Questionnaire did not vary significantly by MELD score. Child-Turcotte-Pugh (CTP) score, a measure of disease severity, was significantly associated with total symptom frequency after transplant ($P = .03$) but was not correlated with any domains on the Short Form-36. In the subcohort of 115 patients, a MELD score greater than 25 at the time of transplantation was associated with greater improvement in physical functioning (11.3 vs 4.8, $P = .02$), role functioning—physical (10.7 vs 4.7, $P = .04$), general health (11.9 vs 5.5, $P = .03$), vitality (10.4 vs 5.2, $P = .02$), and physical component summary (12.3 vs 5.4, $P = .01$) relative to patients with MELD scores of 15 to 25.

Conclusions—The relationship between disease severity before transplant and quality of life after transplant is different depending on the index of disease severity used (MELD vs CTP) and whether the assessment of quality of life is general or specific to transplant-related symptoms. (*Progress in Transplantation*. 2011;21:207-214)

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The Model for End-Stage Liver Disease (MELD) score is used to allocate deceased donor livers for transplantation in the United States.¹ Calculated from total serum levels of bilirubin and creatinine and from the international normalization ratio (INR), the MELD score is an objective assessment that gives adult patients with greater short-term risk of dying the highest priority for liver transplantation. Clinical parameters of chronic liver disease, including ascites and hepatic encephalopathy, which are part of the Child-Turcotte-Pugh (CTP) classification,^{2,3} are not included in MELD calculations because they are inherently subjective and difficult to quantify. Higher MELD and

CTP scores are both indicative of greater disease severity. Both disease severity indices are predictive of short-term mortality in patients with end-stage liver disease,^{4,7} and a high MELD score at time of liver transplantation also is associated with poorer survival rates for patients and grafts.^{6,8}

What is less clear is whether these same clinical parameters of disease severity are associated with other important liver transplant outcomes, such as quality of life (QOL). For both patients and providers alike, the survival and QOL outcomes of transplantation are of critical importance in deciding whether to pursue this treatment option. Moreover, third-party payers are

increasingly interested in QOL after transplant and other functional outcomes. In the era before MELD, research showed that a higher CTP score (worse disease severity) was associated with lower QOL in adults with chronic liver disease.⁹⁻¹² However, these differences tend to dissipate after transplant because of the significantly greater QOL gains reported by patients with higher CTP scores preoperatively.¹²⁻¹⁴

Since the inception of MELD, inconclusive findings have been reported about the relationship between MELD score and QOL parameters for patients with chronic liver diseases.^{15,16} In studies comparing the 2 indexes of disease severity, CTP scores appear to be more strongly related to QOL than are MELD scores.¹⁵ Only 2 studies have examined the relationship between MELD score at time of transplant and QOL after transplant. Castaldo et al¹⁷ reported that a higher MELD score at the time of transplant was significantly associated with higher physical QOL (but not mental QOL) 1 year after transplant, although this effect was small. Russell et al¹⁸ reported that MELD scores of 18 or higher at the time of transplant were positively associated with physical role functioning, but not with any of the other scales on the Short Form-36.

A better understanding of the relationship between disease severity at time of transplant and QOL after transplant might be useful to patients in making decisions about pursuing liver transplantation, determining caregiving and social support needs after liver transplantation, and calibrating expectations about the short- and long-term benefits of liver transplantation. Therefore, the aim of this study was to examine the relationship between MELD score before transplant and QOL and symptom burden after transplant. In addition, we examined whether posttransplant QOL was associated with other disease severity parameters, including CTP score, history of variceal bleeding, and presence of hepatocellular carcinoma.

Methods

Study Population

The study population was surviving adult liver transplant recipients at the University of Florida in Gainesville (2003-2005) and Beth Israel Deaconess Medical Center in Boston, Massachusetts (2005-2009). The study was initiated while the principal investigator (JRR) was the transplant psychologist at the University of Florida and continued when he moved into a similar position at Beth Israel Deaconess Medical Center. At both centers, patients were identified through the Organ Transplant Tracking Record (OTTR; HKS Medical Information Systems, Omaha, Nebraska) and mailed a QOL questionnaire packet 1 year after transplant as part of routine clinical surveillance. Patients who did not complete the written survey by mail were called by clinical staff to complete a structured interview

by telephone. Patients were excluded from this study if they had a primary transplant indication of acute liver failure, underwent retransplantation in the first year after transplant, received a multiorgan transplant, or did not have English proficiency.

All sociodemographic and clinical data were collected by trained research assistants via OTTR and verified by electronic search of the primary hospital medical record. Study procedures were approved by the institutional review boards at both institutions. As the study involved the collection of existing clinical data only, a waiver of informed written consent was obtained.

Disease Severity Indexes

MELD score, used by the United Network for Organ Sharing (UNOS, www.unos.org/resources) for the allocation of livers, was calculated as follows: $\text{MELD score} = [0.957 \times \log_e(\text{creatinine}) + 0.378 \times \log_e(\text{bilirubin}) + 1.12 \times \log_e(\text{INR}) + 0.64] \times 10$. This calculated laboratory MELD score at the time of transplant was recorded. Under UNOS policy 6.3.4.4, patients with hepatocellular carcinoma who meet the Milan criteria are awarded additional MELD points to try to achieve liver transplantation before the cancer progresses to a stage where cure is unlikely. Patients with additional exception points were analyzed by using their biological (or "lab") MELD score without the addition of exception points as the lab MELD score is more reflective of the severity of the patient's liver disease. All MELD scores subsequently described in this article are lab MELD scores. Patients were stratified into 3 groups on the basis of their lab MELD scores: scores 15 or less, scores 16 to 25, and scores greater than 25.

CTP score³ was calculated by using data available at the time of liver transplantation. These data included the presence and grade of encephalopathy, the presence and severity (mild/moderate or severe) of ascites, bilirubin level, albumin level, and prothrombin time or INR. Patients were stratified into 3 groups on the basis of their CTP scores: scores 5 or 6, scores 7 to 9, and scores 10 to 15. Additionally, we recorded whether the patient had a history of bleeding esophageal varices and hepatocellular carcinoma. The use of antiviral therapy for recurrent infection with hepatitis C virus within 1 year of transplant was recorded for patients who received a transplant because of infection with hepatitis C virus.

Sociodemographic and Clinical Variables

Information was gathered about patients' age, sex, race, employment status before and after transplant, and current body mass index. The primary cause of chronic liver disease was recorded and grouped into 6 categories: (1) viral hepatitis, (2) autoimmune or

cholestatic disease, (3) metabolic (eg, Wilson disease, α_1 -antitrypsin, hemochromatosis), (4) nonalcoholic steatohepatitis/cryptogenic, (5) alcohol, or (6) other (eg, sarcoidosis, polycystic liver disease).

QOL Assessment

The Short Form-36 Health Survey. Version 2 of the Short Form-36 Health Survey (SF-36v2)¹⁹ is a generic measure used to assess patients' perceptions of QOL across 8 domains: physical functioning (the extent that health limits physical activities such as self-care, walking, climbing stairs, bending, lifting, and moderate to vigorous activities), role functioning—physical (the extent to which physical health interferes with work or other daily activities, such as accomplishing less than desired or limitations in type of activities), role functioning—emotional (the extent to which emotional problems interfere with work or other daily activities, including decreased productivity or quality of time spent on activities), bodily pain (the intensity of pain and the effect of pain on activities), general health (personal evaluation of health, health outlook, and perceived resiliency to illness), vitality (the extent of feelings of energy versus feelings of fatigue), social functioning (the extent to which physical health or emotional problems interfere with normal social activities), and mental health (general mental health, including depression, anxiety, behavioral-emotional control, and positive affect).

These domains are included in 2 composite scores: the physical component summary and the mental component summary. These scales are standardized to the general population with a mean score of 50 and a standard deviation of 10. Higher scores reflect better QOL. Our previous research with this population found the Short Form-36 to have high levels of internal consistency and construct validity.²⁰

Transplant Symptom Frequency Questionnaire. The Transplant Symptom Frequency Questionnaire (TSFQ)^{20,21} was developed for use specifically with transplant patients and measures both the frequency (0=never have symptom to 4=always have symptom) and severity (0=symptom is not a problem, 1=symptom is a problem) of 33 symptoms. A total frequency score is obtained by summing all items, and a total problem or severity score is obtained by adding the number of symptoms affirmed by the patient as being problematic. Also, frequency scores are obtained across 6 subscales: affective distress, neurocognitive symptoms, physical appearance changes, gastrointestinal distress, appetite/weight changes, and miscellaneous symptoms. We have previously noted good construct validity and high internal consistency for the TSFQ.²²

A subset of patients at the University of Florida (n = 115), as part of their clinical care, completed the

SF-36v2 at the time of their pretransplant evaluation. We recorded these scores to examine the degree of change in QOL over time, and to determine its association with clinical variables.

Statistical Analysis

Means (SDs) and proportions were calculated for continuous and categorical variables, respectively. Fisher exact tests and *t* tests were used to examine differences between the 2 transplant centers. Pearson correlation coefficients, *t* tests, and 1-way analyses of variance were used to examine the relationship between QOL outcomes and sociodemographic variables and clinical parameters. For the prospective QOL cohort (n = 115), we calculated change scores from baseline to 1 year after transplant and then used Pearson correlation coefficients and *t* tests to assess their relationship to clinical parameters at time of transplant. Finally, we used multiple linear regression analysis to assess predictors of QOL. To reduce the number of outcome variables, we limited the regression analyses to the prediction of QOL summary scores (SF-36v2 physical, SF-36v2 mental component summary, TSFQ total frequency score). Predictors included age, sex, race, employment status, body mass index, disease cause, variceal bleeding, hepatocellular carcinoma, lab MELD score, and CTP score. In all analyses, a *P* value of .05 or less was considered statistically significant. PASW Statistics 17.0 (SPSS Inc, Chicago, Illinois) was used for all statistical analyses.

Results

A total of 486 adults (330 at the University of Florida, 156 at Beth Israel Deaconess Medical Center) underwent liver transplantation during the study period. We excluded 139 patients due to death (n=67), retransplantation (n=19), combined liver-kidney transplantation (n=25), transplant indication of acute liver failure (n=8), live donor liver transplantation (n=4), and the lack of English proficiency (n=16). Of the remaining 347 patients, we obtained QOL data 1 year after transplant from 265 patients (170 at the University of Florida, 95 at Beth Israel Deaconess Medical Center). Overall participation rate among those patients eligible for the study was 76% (University of Florida, 73%; Beth Israel Deaconess Medical Center, 84%).

Sociodemographic and Clinical Characteristics

Table 1 presents the sociodemographic and clinical characteristics for the entire sample in the study. Patients at the 2 transplant centers were comparable on most variables. However, the University of Florida cohort had more women (39% vs 18%, *P* < .001), more patients with a history of esophageal bleeding (32% vs 17%, *P* = .01), and a lower mean MELD score (18.3 vs 20.5, *P* = .04) and CTP score (8.9 vs 9.5, *P* = .05) at

Table 1 Characteristics of 265 patients in the study

Characteristic	Value ^a
Age, mean (SD), y	54.4 (9.2)
Sex, female	83 (31)
Race	
White	210 (79)
African American	17 (6)
Hispanic	23 (9)
Asian	10 (4)
Other	5 (2)
Employed the year preceding transplant	107 (40)
Employed the year after transplant	88 (33)
Body mass index, ^b mean (SD)	27.8 (5.0)
Reason for transplantation	
Viral hepatitis	152 (57)
Autoimmune or cholestatic diseases	28 (11)
Metabolic	5 (2)
Nonalcoholic steatohepatitis/cryptogenic	12 (5)
Alcohol	57 (22)
Other	11 (4)
History of ascites	168 (63)
History of encephalopathy	139 (52)
History of variceal bleeding	70 (26)
Hepatocellular carcinoma	87 (33)
MELD score at transplant, without exception points, mean (SD)	19.1 (8.7)
MELD score at transplant, with exception points, mean (SD)	22.6 (7.6)
CTP score at transplant, mean (SD)	9.3 (2.5)

Abbreviations: CTP, Child-Turcotte-Pugh; MELD, Model for End-Stage Liver Disease.

^a Values are number (%) of patients unless indicated otherwise.

^b Calculated as the weight in kilograms divided by height in meters squared.

transplant than did the Beth Israel Deaconess Medical Center cohort.

For the entire sample, the mean age was 54 years, 31% were female, and most (79%) were white. The most common indication for transplantation was viral hepatitis (51% hepatitis C, 6% hepatitis B), followed by alcohol (22%), and autoimmune or cholestatic diseases (11%). One-third (33%) had hepatocellular carcinoma. Most patients (82%) had 1 or more manifestations of clinical decompensation, including a history of ascites (63%), encephalopathy (52%), and variceal bleeding (26%). The mean lab MELD score at transplant was 19, with a categorical breakdown as follows: MELD score 15 or less (111, 42%), 16 to 25 (103, 39%), and greater than 25 (51, 19%). The mean MELD score with exception points was 23, although this score was not used in subsequent analyses. The mean CTP score was 9, with 36 patients (14%) with scores of 5 or 6, 117 (44%) with scores of 7 to 9, and

112 (42%) with scores of 10 to 15. Lab MELD score was significantly correlated with CTP score ($r=0.52$, $P<.001$).

Quality of Life

The University of Florida and Beth Israel Deaconess Medical Center cohorts did not differ significantly from each other on the QOL measures (all P values $>.05$). For the entire sample, SF-36v2 scores were significantly lower than the scores for the United States normative sample (all P values $<.001$; Figure 1). Univariable analyses showed that SF-36v2 scores were not significantly associated with any sociodemographic characteristics (all P values $>.05$). Patients with MELD scores greater than 25 at transplant had higher general health and physical component summary scores than did those patients with MELD scores of 25 or less at transplant (Table 2). Also, patients with a history of variceal bleeding had higher scores for bodily pain (48.9 vs 44.7, $t=2.6$, $P=.01$) and higher scores for the physical component summary (43.7 vs 40.7, $t=2.0$, $P=.05$). SF-36v2 scores were not significantly associated with CTP classification, history of hepatocellular carcinoma, or interferon treatment for recurrent infection with hepatitis C virus in the year after transplant (all P values $>.05$).

On the TSFQ, patients' scores did not vary significantly on the basis of MELD classification (Table 2). However, TSFQ scores were significantly associated with CTP classifications. Relative to those with moderate (7-9) or high (10-15) CTP scores at transplant, patients with low CTP scores (5-7) had lower scores for affective distress ($P=.005$), gastrointestinal distress ($P=.03$), and total symptom frequency ($P=.03$). Patients with a history of hepatocellular carcinoma had lower scores for affective distress (11.3 vs 14.5, $t=3.1$, $P=.002$), gastrointestinal distress (6.1 vs 7.6, $t=2.5$, $P=.01$), appetite/weight changes (4.8 vs 5.7, $t=2.2$, $P=.03$), and total symptom frequency (49.0 vs 58.0, $t=2.8$, $P=.006$) than did patients without hepatocellular carcinoma. Female and unemployed patients reported more symptoms on all TSFQ scales than did men and patients who were working in the year after transplant (P values all $<.05$). Younger patients (≤ 50 years old) had higher scores for affective distress (15.2 vs 8.7, $F=9.1$, $P<.001$), neurocognitive symptoms (9.3 vs 6.5, $F=4.1$, $P=.02$), and appetite/weight changes (5.4 vs 3.5, $F=5.2$, $P=.006$) scores than older patients (≥ 65 years old) had. TSFQ scores did not vary significantly on the basis of history of variceal bleeding or whether patients received interferon treatment for recurrent infection with hepatitis C virus in the year after transplant.

For the cohort ($n=115$) that had SF-36v2 scores from both before and after transplant, QOL improved significantly in all domains after transplant (Figure 2).

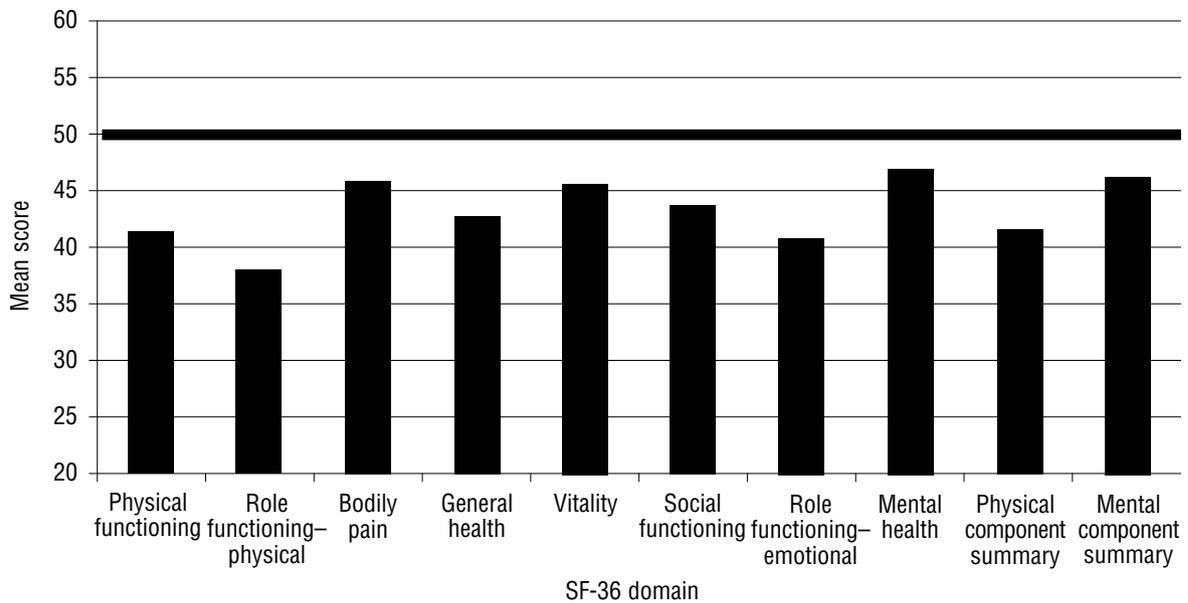


Figure 1 Mean scores on version 2 of the Short-Form-36 (SF-36) after transplant for 265 study patients. Mean score for normal US control subjects (N = 6742) is 50 (SD, 10) and is reflected by the bold horizontal bar. $P < .001$ for all comparisons between study sample and normal control subjects.

We examined whether the change in QOL scores from baseline to 1 year after transplant was associated with clinical parameters at the time of transplant. SF-36v2 change scores differed significantly with lab MELD classification. Patients with MELD scores greater than 25 at transplant reported more improvement in physical functioning (11.3 vs 4.8, $P = .02$), role functioning-physical (10.7 vs 4.7, $P = .04$), general health (11.9 vs 5.5, $P = .03$), vitality (10.4 vs 5.2, $P = .02$), and physical component summary (12.3 vs 5.4, $P = .01$) than did patients with MELD scores from 15 to 25 at transplant. CTP score (P values all $> .17$), variceal bleeding (P values all $> .14$), and presence of hepatocellular carcinoma (P values all $> .18$) were not significantly associated with changes in SF-36v2 scores.

Multivariable Predictors of QOL

In the linear regression analysis, higher lab MELD score (β coefficient = 0.24, $P = .001$) was predictive of higher SF-36v2 PCS scores (adjusted $R^2 = 0.06$, $F = 10.6$, $P < .001$). Age, sex, race, employment status, body mass index, cause of disease, variceal bleeding, hepatocellular carcinoma, and CTP score were not predictive of SF-36v2 scores. Higher CTP score (β coefficient = 0.13, $P = .04$), younger age (β coefficient = -0.16, $P = .04$) and current unemployment (β coefficient = 0.42, $P < .001$) were predictive of higher total symptom frequency scores on the TSFQ (adjusted $R^2 = 0.16$, $F = 15.7$, $P < .001$). Sex, race, body mass index, cause of disease, variceal bleeding, and hepatocellular carcinoma were not predictive of TSFQ total symptom frequency scores.

Discussion

For adults with end-stage liver disease, liver transplantation is the best option for better QOL and long-term survival. The current liver allocation policy prioritizes patients with the highest disease severity and the shortest predicted survival time. Our study adds to the literature by examining the relationship between disease severity at time of transplant and QOL 1 year after transplant.

We found that adults with lab MELD scores greater than 25 at time of transplant had better QOL after transplant on 1 SF-36v2 scale (general health) and 1 composite measure (physical component summary) than did patients with lower MELD scores. Even for those SF-36v2 scales for which the differences were not statistically significant, scores tended to be higher for patients with MELD scores greater than 25 than for patients with low (< 15) or moderate (15-25) MELD scores. Additionally, for the cohort with SF-36v2 assessments from before and after transplant, adults with higher MELD scores (> 25) before transplant had significantly more improvement in QOL scores over time. These findings mirror those reported by Castaldo et al¹⁷ and suggest that adults with more severe liver disease, as measured by lab MELD score and not adjusted for exception points, perceive a more dramatic change in QOL after transplant. Although patients with lower MELD scores before transplant may still have had some functional capacity, those with more severe disease may have had considerably more limitations in their physical activity, higher levels of fatigue, more limited engagement in role-based

Table 2 Univariable analysis of the relationship between SF-36v2 scores and disease severity indices

Variable	MELD score, mean (SD)			<i>P</i> ^a	CTP score, mean (SD)			<i>P</i> ^a
	≤15 (n = 111)	16-25 (n = 103)	>25 (n = 51)		5-6 (n = 36)	7-9 (n = 117)	10-15 (n = 111)	
SF-36v2								
Physical functioning	41.3 (11)	40.0 (11)	44.2 (10)	.07	43.4 (11)	40.1 (11)	42.0 (11)	.21
Role functioning—physical	37.3 (12)	37.1 (13)	41.3 (13)	.11	41.5 (12)	36.4 (12)	38.4 (13)	.09
Bodily pain	46.0 (12)	45.1 (12)	46.8 (12)	.70	47.2 (10)	44.7 (13)	46.6 (12)	.37
General health	41.0 (12)	42.3 (11)	47.5 (11) ^b	.004	41.9 (13)	42.4 (11)	43.4 (12)	.75
Vitality	45.0 (11)	45.2 (11)	47.5 (11)	.31	47.5 (12)	44.8 (11)	45.8 (11)	.44
Social functioning	42.2 (13)	43.8 (13)	47.0 (13)	.10	45.3 (12)	42.5 (13)	44.4 (13)	.41
Role functioning—emotional	40.6 (15)	40.6 (13)	41.6 (15)	.90	45.2 (14)	40.2 (14)	40.0 (14)	.14
Mental health	46.3 (12)	46.5 (11)	49.3 (11)	.27	47.2 (12)	46.6 (12)	47.3 (11)	.91
Physical component summary	40.8 (11)	40.4 (11)	45.3 (10) ^b	.02	43.5 (10)	40.5 (11)	42.0 (10)	.29
Mental component summary	45.2 (13)	46.1 (12)	49.4 (11)	.12	47.7 (11)	46.1 (13)	46.2 (12)	.78
TSFQ								
Affective distress	13.3 (8)	14.4 (8)	12.0 (7)	.17	9.6 (7) ^b	14.2 (8)	13.9 (7)	.005
Neurocognitive symptoms	8.6 (5)	8.1 (5)	9.0 (5)	.46	7.3 (4)	8.7 (5)	8.6 (5)	.30
Physical appearance changes	6.4 (5)	6.7 (4)	7.3 (6)	.53	5.3 (5)	7.1 (5)	6.7 (5)	.13
Gastrointestinal distress	7.7 (4)	7.0 (4)	6.2 (4)	.11	5.4 (3)	7.5 (5)	7.3 (4)	.03
Appetite/weight changes	4.6 (3)	5.4 (3)	4.8 (2)	.10	4.5 (3)	4.8 (3)	5.3 (3)	.30
Miscellaneous symptoms	13.0 (7)	11.8 (6)	12.4 (6)	.38	11.3 (7)	12.6 (7)	12.6 (6)	.52
Total symptom frequency	53.6 (26)	53.3 (22)	51.7 (23)	.89	43.4 (22)	54.9 (24)	54.4 (23)	.03

Abbreviations: CTP, Child-Turcotte-Pugh; MELD, Model for End-Stage Liver Disease; SF-36v2, version 2 of the Short Form-36; TSFQ, Transplant Symptom Frequency Questionnaire.

^a Values less than .05 indicate a significant difference between groups.

^b This value denotes a statistically significant difference compared with values on the same row.

activities (eg, work, household management, child care), fewer social activities, and more emotional distress. Patients with higher MELD scores before transplant may simply have more room for QOL improvement after transplant, and these QOL gains may be more apparent to them, relative to patients with lower MELD scores.

In contrast to the SF-36v2 findings, we observed that MELD score was not significantly associated with symptoms after transplant as measured by the TSFQ. Symptoms of affective distress, neurocognitive problems, gastrointestinal distress, appetite and weight changes, and changes in appearance 1 year after transplant were not significantly different according to MELD group assignment. In contrast to the SF-36v2, which is a more general health status QOL measure, the TSFQ is more sensitive to symptom changes due to the posttransplant immunosuppression regimen and its associated side effects. Therefore, 1 year after transplant, we can reasonably expect little variability in these specific symptoms as a function of the MELD score before transplant.

Particularly noteworthy is our finding that MELD and CTP scores from before transplant affected different aspects of QOL after transplant. As noted previously, MELD score was associated with general QOL but not transplant-specific symptoms. However, we found just the opposite when using CTP score as our measure of disease severity. Specifically, CTP score

was not significantly associated with SF-36v2 scores, but in both our univariable and multivariable analyses, adults with moderate (7-9) or high (10-15) CTP scores at transplant had more affective distress, more gastrointestinal distress, and more total symptom frequency on the TSFQ 1 year after transplant than those with low (5-6) CTP scores. Different findings in the literature about the relationship between disease severity and QOL after transplant may be a function of how QOL is measured (general or specific) and what disease severity index is used (MELD or CPT).

The relationship between MELD and CTP scores is strong ($r=0.52$), but these 2 indexes clearly are measuring different illness parameters. General QOL appears to be more sensitive to changes in MELD score, whereas more symptom-specific QOL is affected more by variations in CTP score. It is possible that the presence and severity of encephalopathy symptoms, which is part of CTP but not MELD, may account for this observed difference. Future studies examining the relationship between disease severity and QOL should consider a more comprehensive assessment of encephalopathy and cognitive impairment. We recommend that researchers interested in these associations include both generic and specific QOL measures, as well as both indexes of liver disease severity.

Mental QOL was not associated with MELD or CTP score before transplant. Castaldo et al¹⁷ also failed to find a significant correlation between MELD

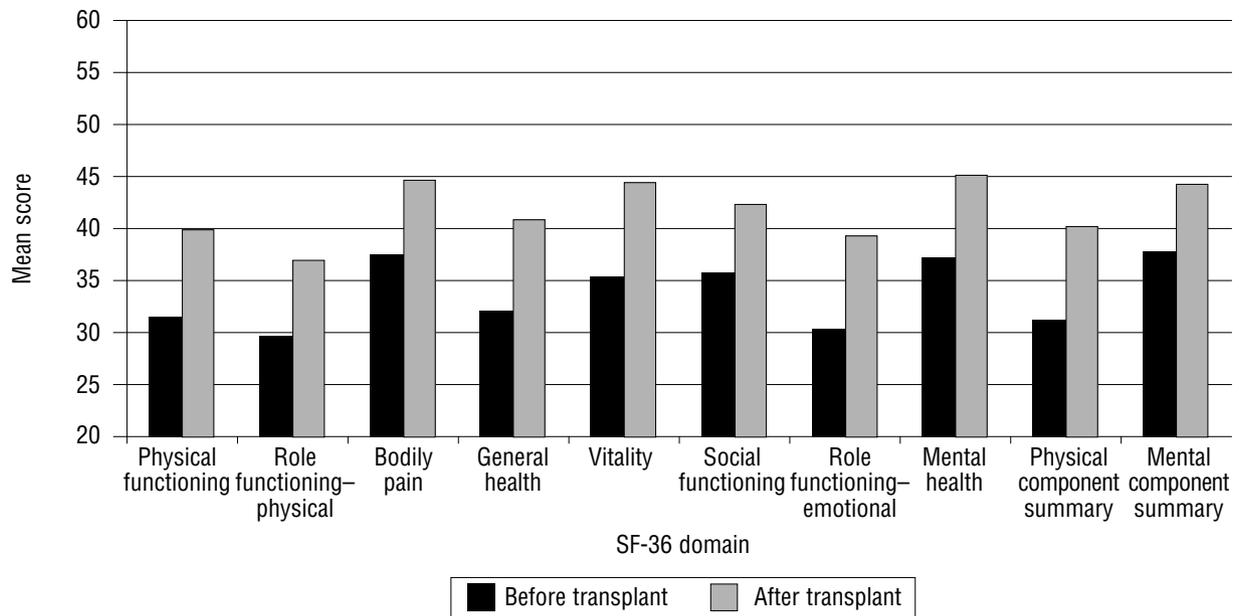


Figure 2 Mean scores on version 2 of the Short-Form-36 (SF-36) for 115 study patients before and after transplant. $P < .001$ for all comparisons.

score and postoperative mental QOL. Although mental QOL before transplant may be affected by disease severity,^{9,16} the strength of this relationship appears to dissipate after transplant. As seen in our prospective subcohort and consistent with previous findings,^{17,23} mental QOL improves dramatically after transplant. It is likely that mental QOL in the months after transplant is affected more by factors other than preoperative disease severity (eg, premorbid psychological functioning, social support, resolution of encephalopathy).

Study Strengths/Limitations and Clinical Implications

This study had several strengths, including multi-site data collection, wide variability in disease severity at time of transplant, the use of both general and specific QOL measures, and the inclusion of a subcohort with SF-36v2 data from both before and after transplant. Moreover, the sociodemographic and clinical characteristics of our study sample are representative of those who undergo liver transplantation in the United States. Nevertheless, our findings should be considered within the context of a few methodological limitations. First, although our participation rate was high and comparable to what has been reported by others,¹⁷ there still may be a selection bias. For instance, it is possible that the QOL of those who chose to complete the routine clinical assessment after transplant is not representative of the larger population of transplant recipients at our 2 centers. Second, we did not assess for medical comorbid conditions that could affect QOL after transplant, including chronic pain, new-onset diabetes, and cardiovascular diseases,

to name a few. Third, our primary analyses are based on a single assessment of QOL 1 year after transplant. It is conceivable that the trajectory for QOL recovery varies by MELD or CTP score and measuring QOL at a different time points after transplant (eg, 6 months, 2 years) may have yielded very different results.

Findings suggest that many patients with high disease severity are likely to see improvement in health-related QOL in the year after transplant. During the time of advancing disease severity and impaired QOL, the psychological resiliency of patients and their caregivers is challenged by the uncertainty of survival and the fear of death. Health care providers can offer support and guidance to patients and their caregivers about the gains in physical functioning, resumption of roles, and increased vitality that transplantation is likely to provide. Moreover, some emerging evidence indicates that psychological interventions targeting improvements in QOL can benefit both patients and their caregivers during the transplant waiting period,²⁴⁻²⁶ although whether these QOL and psychological gains are maintained after transplant is unknown.

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None reported.

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