

Liver transplant recipients: individual, social, and environmental resources

Context—Patient characteristics are important in the liver transplant population because of proven associations between individual and environmental factors, treatment adherence, and health outcomes in general medical and other transplant populations.

Objective—To determine generalizability of the sample to other liver transplant populations and to establish reliability of measures used to assess individual and environmental resources.

Design—Cross-sectional analysis of baseline data in a longitudinal study of adherence and health outcomes.

Participants, Setting—Ninety first-time adult liver transplant recipients at the University of Pittsburgh Medical Center completed assessments of sociodemographic, health history, psychosocial, and environmental factors shortly after surgery; adherence and health outcomes were tracked throughout the study.

Results—The medical center cohort was older, less racially diverse, and contained more living donors than the national sample. Our sample was generally comparable to the medical center cohort on pretransplant sociodemographic and clinical characteristics. Reliability/internal consistency on psychological measures was similar between our sample and most published norms. The mean scores on all coping scales in our sample were higher than normative. Our patients indicated a more negative perception of family environment and perceived relationships with their primary caregiver more positively than did the normative group.

Conclusion—The generalizability of our sample to the parent population and reliability of individual and environmental measures reported here will enable us to examine relationships and the value of patient and contextual resources for predicting treatment adherence and health outcomes among liver transplant recipients. (*Progress in Transplantation*. 2010;20:68-74)

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Transplantation is the only option for survival of end-stage liver disease; demand for organs far exceeds supply. Advances in medical management and surgical technique account for the current success (72.5% 5-year survival rate in the United States¹) of liver transplantation; however, little is known about the personal characteristics of candidates who have a good prognosis. The liver transplant population varies widely on psychiatric history and cause of end-stage liver disease. Psychiatric disorders, including alcohol and/or drug abuse and cognitive dysfunction, are common in this population.^{2,3} Prevalence of personality disorders, primarily antisocial disorder, may approach 30% in the liver transplant population.⁴ Similar levels of depression, anxiety, and social support as well as similar mean scores of personality traits among candidates for lung, heart, and liver transplantation have

been reported.⁵ It would have been interesting to know range of scores on the personality measure, because extreme values on some traits (eg, high neuroticism, low openness) are consistently correlated with presence of personality disorders.⁶

Patients' characteristics are important in the liver transplant population because of proven associations between individual and environmental factors and treatment adherence and subsequent health outcomes in other populations. For instance, pretransplant medication nonadherence, assessed with self-report, among candidates for cardiothoracic and liver transplantation was prevalent and similar in both cohorts⁷ and was related to lower levels of depression, trait conscientiousness, and less social support among lung candidates.⁸ Previous studies of posttransplant adherence in this population have been focused primarily on return

to drinking among recipients who received a transplant because of alcoholic cirrhosis.⁹ No consistent predictors of relapse have been found, including a pretransplant diagnosis of alcoholic liver disease^{10,11}; patients with a history of alcohol dependence rather than abuse are more likely to relapse.¹² Neither is alcohol abuse or dependence a reliable predictor of pretransplant psychological morbidity.¹³ As with alcohol, pretransplant drug use is not related to posttransplant mortality; although return to use does occur, history of use alone is not a reliable predictor of posttransplant relapse.^{14,15}

Clear links between adherence to treatment regimens and health outcomes have been found, both in general medicine and in transplantation¹⁶⁻¹⁸ and between psychological and contextual factors, adherence, and health.¹⁹⁻²¹ Nonadherence is implicated in quality of life and morbidity in other transplant populations,²²⁻²⁵ and noncompliance is directly related (among other transplant recipients) to the leading causes of late mortality (chronic rejection, de novo malignant neoplasms) in liver transplant recipients.^{26,27} No known studies have examined a broad range of patient and environmental factors that may be related to adherence with all aspects of the treatment regimen (appointment keeping, medication taking, lifestyle changes) and health outcomes in the general liver transplant population.

The liver transplant population may or may not be similar, with regard to adherence, to other whole-organ transplant groups. This study, based on Christensen's interactionist theory of adherence,²⁸ is designed to examine the impact of individual and contextual factors on adherence and health outcomes among liver transplant recipients. Accordingly, one goal of this project is to prospectively assess potential correlates and predictors of adherence to the entire treatment regimen (appointment keeping; medication taking; and abstinence from alcohol, tobacco, and nonprescription drugs) and health outcomes in liver transplant recipients. The first step in that process is to describe characteristics of the sample and internal reliability of the measures in this population. Given the wide range of pretransplant psychological characteristics (which underlie patterns of behavior) in this group, we focused on the patient as a unique individual in the context of highly stressful chronic illness and complex treatment regimens rather than on diagnosis of psychological or cognitive pathology. We chose to represent patient characteristics with patient and environmental factors that are relatively stable yet are amenable to change with appropriate interventions, could be assessed before transplantation, and have been identified as important predictors of adherence and outcome in medicine and transplantation.

This report is focused on background characteristics of the sample and on individual, social, and environmental resources of the initial cohort of liver

transplant recipients. This information is critical to our long-term objective of identifying liver transplant recipients at risk of poor adherence and long-term prognoses early in the transplant process.

Methods and Materials

Study Setting and Sample

All procedures are in accord with the Helsinki Declaration of 1975; approval from the University of Pittsburgh's institutional review board and the Starzl Transplant Institute's data safety and monitoring board were obtained before patients were recruited. Informed consent was obtained from all patients at the time of enrollment, either in the hospital or at an outpatient clinic appointment within 1 to 2 months after discharge.

Participants were recruited from the population of adult liver transplant recipients at the University of Pittsburgh Medical Center (UPMC), Starzl Transplant Institute. During the period from October 2006 to October 2007, 172 patients underwent a liver transplant. Of that group, 143 were eligible (first-time liver transplant, English speaking, physically and cognitively able to participate in the study). One hundred twenty-two potential subjects (85% of those eligible) were told about the study by members of the clinical staff, 101 recipients (83%) agreed to be contacted by members of the research staff, 90 recipients (89% of those contacted) were enrolled (see discussion for further explanation).

Procedure

Participants, who were 2 to 4 months past transplant at the time, completed a battery of self-report measures and participated in a baseline interview with a member of the study team. Adherence to the treatment regimen (appointment keeping, medication taking, lifestyle changes) and health outcomes (quality of life, morbidity, and mortality) were tracked with electronic monitoring and interviews for 1 year and with medical records for the duration of the study.

Measures

Sociodemographic Characteristics and Health History. Sociodemographic information was elicited during the baseline interview with a measure designed and used in the Center for Research in Chronic Disorders at the University of Pittsburgh.

Medical and mental health history were obtained at the baseline session with a comprehensive interview developed in research with chronic medical patients and cardiothoracic transplant recipients²² and from medical records. The interview was modified to include additional information pertinent to liver transplant recipients (eg, drug/alcohol use, addiction rehabilitation, and length of abstinence before transplant). When self-report and medical records were

incongruent, we relied on data from the medical records to determine history of substance abuse.

Transplant-related information (eg, documented history of substance abuse, pretransplant diagnosis, donor type) was obtained from review of medical records.

Psychological, Social, and Environmental Factors. Coping style, as it pertains to health problems related to liver transplantation, was assessed with the Coping Responses Inventory, a 48-item Likert scale instrument that can be used to assess 8 types of coping styles by using the approach-avoidant framework.²⁹ Each style of coping is represented by 4 scales, each comprising 6 items scored from 1 to 4. Higher scores reflect more frequent use of the coping response to problems.

Patterns of decision making, critical to sustaining adherence, were assessed with the Dysregulation Inventory, a 92-item self-report developed by researchers at the University of Pittsburgh to determine risk of substance abuse. This is the first time the measure has been used in an organ transplant population and is particularly relevant given the lifestyle changes required of many recipients. The Dysregulation Inventory is used to assess 3 types of dysregulation. Affective dysregulation represents degree of negative affectivity and irritability; behavioral dysregulation is impulsivity, sensation seeking, and aggression; cognitive dysregulation is less strategic thinking, problem solving, and self-monitoring.³⁰ Items are scored from 0 to 3; the affective and cognitive scales are each represented by 28 items, the behavioral scale comprises 36 items. Higher score reflects more dysregulation.

Cynical hostility, an intrapersonal trait marked by mistrust, suspiciousness, and easily aroused anger, has long been associated with high-risk behaviors and health outcomes and predicted medication noncompliance among patients in therapy for end-stage kidney disease and hepatitis C.³¹ The Cook-Medley Hostility Scale was used to assess level of trait hostility. The scale is composed of 50 true/false items; lower scores indicate higher levels of hostility.³²

Relationship with spouse/caregiver was assessed with the 32-item Dyadic Adjustment Scale, which has been widely used in clinical and research work with couples. Items are scored from 0 to 5, higher score represents a closer relationship. Norms are presented for married and divorced couples.³³ We examine the total score to assess level of caregiver support.

Family support was assessed with the Family Relations Index from the Family Environment Scale³⁴; this index characterizes the recipient's perception of family cohesion, expressiveness, and conflict and yields a measure of positive vs negative perception of family support. Each scale is represented by 9 items answered true/false, lower score represents stronger perception

of the construct. A total score is calculated by summing the cohesion and expressiveness scales and subtracting the conflict scale; a higher total Family Relations Index score represents a more positive perception of the family environment. This scale has been used with kidney transplant patients.³⁵

Social network was evaluated with the Lubben Social Network Scale, an 8-item self-report instrument that describes family, friend, and community networks and confidence in relationships.^{36,37} Each item is scored from 0 to 5, higher score indicates more involvement with others. A ninth item, scored from 0 to 4 elicits information about composition of the household and reliance of others on the subject for help with household chores (eg shopping, cleaning, child care), higher score indicates helping more often.

Access to health care facilities and personnel in the community is essential to posttransplant care. Proximity and accessibility (logistically and financially) to physicians, visiting nurses, social service professionals, hospital, laboratory, pharmacy, and transportation were assessed in an interview with an investigator-designed questionnaire.

Analytic Strategies

First, descriptive statistics were used to compare this sample on sociodemographic and transplant-related characteristics with US liver transplant recipients based on data from United Network for Organ Sharing to assess the generalizability of our parent population. Second, the sample was compared with data from the Starzl Transplant Institute registry to assess generalizability of our sample to other UPMC liver transplant recipients. And third, sample statistics (central tendency, range, and coefficient alpha) on psychosocial measures were compared with published norms (when available) to assess for comparability of sample and normative data. Last, sample sociodemographic data were examined with *t* tests and χ^2 analyses to explore differences between recipients with or without a history of substance abuse before transplantation.

Results

Sociodemographic and transplant clinical characteristics of the national population, the UPMC population, and our sample are illustrated in Table 1. The UPMC sample is less racially diverse and contains more older patients than the national sample but is otherwise similar. Although some differences were apparent, sociodemographic and clinical criteria were generally similar in our sample and the UPMC cohort. Our sample is older (7.9% fewer patients in the under 50 age group) with a higher percentage (55.5%) of recipients receiving a transplant because of alcoholic cirrhosis or hepatitis C and more (5.2%) living donor

Table 1 Background characteristics of the 2007 national population, University of Pittsburgh Medical Center (UPMC) population, and the study sample of liver transplant recipients

Characteristic	No. (%) of recipients		
	National (n = 6494) ^a	UPMC (n = 172)	Sample (n = 90)
Age, y			
<50	1703 (26.2)	48 (27.9)	18 (20.0)
50-64	3539 (54.5)	93 (54.1)	54 (60.0)
≥65	647 (10.6)	31 (18.0)	18 (20.0)
Male sex	3993 (61.5)	112 (65.1)	57 (63.3)
White race	4584 (70.6)	160 (93.0)	86 (95.6)
Pretransplant diagnosis			
Alcoholic cirrhosis	1018 (17.3)	26 (15.1)	22 (24.4)
Hepatitis C	1373 (23.3)	45 (26.2)	28 (31.1)
Nonalcoholic steatohepatitis	287 (4.9)	18 (10.5)	11 (12.2)
Cryptogenic cirrhosis	357 (6.1)	12 (7.0)	8 (8.9)
Living donor	266 (4.1)	17 (9.9)	14 (15.6)

^a Data from the United Network for Organ Sharing (<http://www.optn.org>). For age and pretransplant diagnosis, only 5889 diagnoses were available for 2007.

transplants than the UPMC cohort. In addition to sociodemographic information in the table, most of our recipients were married and had completed some education after high school. Twenty-five recipients (27.8%) reported annual household income of less than \$30,000, 11 recipients (12.2%) reported income of more than \$100,000. Seventy-three recipients (81.1% of the sample) reported that their household income was adequate to meet basic needs. Recipients in every income bracket reported that revenue was inadequate to meet basic needs but the majority (47% of them) were in the lowest category.

As for general health history, 22 of our recipients reported more than 1 medical disorder; the most common diagnosis was diabetes (39 recipients, 43.3%); 33 recipients (36.7%) had a history of cardiovascular disease; 3 recipients had a history of HIV disease. Twenty-five recipients (27.8%) reported more than 1 mood disorder; the most common psychiatric comorbid diseases were depression and anxiety, 3 recipients reported a history of bipolar disorder. Forty-two percent of the sample (38 recipients) had a documented history of substance abuse. Twenty-three liver transplant recipients had a history of alcohol abuse, 3 had a history of intravenous drug abuse, and 12 had a history of both alcohol and intravenous drug abuse documented in medical records. Length of abstinence from alcohol before transplantation ranged from 3 months to 17 years with a median of 23 months; abstinence from drug use ranged from 1 month to more than 30 years. Thirteen recipients went through alcohol rehabilitation treatment before transplant, 4 recipients participated in a drug rehabilitation program.

Normative data from publications and manuals and sample data on psychosocial measures are presented in Table 2. Coefficient α statistics show that

reliability/internal consistency on psychological measures for our sample was similar to published norms. Reliability values on measures of social support, except for the conflict scale on the Family Relations Index, are acceptable but are slightly lower than those for the normative groups. The mean scores on all coping scales in our sample are higher than published norms. Our sample mean for total score on the Family Relations Index indicates a more negative perception of family environment than in the normative group. At the same time, our recipients perceived relationships with their primary caregiver (usually the spouse) more positively than did the normative group.

Normative scores for the Cook Medley Hostility scale and the Lubben Social Networking Scale are unavailable. Forty-one recipients (45.5%) endorsed high (scores above the median) levels of hostility; 59 recipients (65.5%) reported very frequent or daily interaction with others. Distance to physician and pharmacy was a problem for 3 subjects, and distance to hospital and laboratory was a problem for 2 subjects. All recipients would be able to get a nurse to come to the home; 18 subjects did not know if they would be able to arrange a home visit from a social worker but the rest of the sample reported that they could.

Discussion

This report describes individual, social, and environmental resources that are known to affect adherence and outcomes in other populations among a sample of first-time liver transplant recipients. This study is the first known to comprehensively assess these factors in the greater liver transplant population and significantly adds to the knowledge base about liver transplant patients. The long-term goal of this research is to integrate findings about these resources

Table 2 Means, standard deviations, and internal consistencies (Cronbach α) for normative groups (reference) and the sample of liver transplant recipients on measures of psychosocial function

Measure	Normative group				Sample	
	Mean (SD)		α		Mean (SD); range	α
	Male	Female	Male	Female		
Coping Responses Inventory (n = 20)						
Approach responses						
Logical analysis	11 (4.0)	11.5 (3.9)	0.67	0.64	15.7 (3.9); 6-24	0.67
Positive reappraisal	10.3 (4.7)	10.7 (4.4)	0.74	0.71	18.1 (4.1); 6-24	0.76
Seeking guidance and support	8.8 (4.0)	10.2 (4.0)	0.61	0.60	17 (4.0); 8-24	0.69
Problem solving	10.8 (4.3)	11.2 (4.1)	0.68	0.63	18.2 (3.5); 5-24	0.61
Avoidant responses						
Cognitive avoidance	6.7 (4.3)	6.8 (4.2)	0.72	0.70	13.6 (3.9); 6-23	0.72
Acceptance/resignation	7.2 (4.3)	7.6 (4.2)	0.64	0.60	13.9 (4.1); 6-23	0.68
Seeking alternative rewards	5.2 (4.2)	6.6 (4.5)	0.68	0.71	12.4 (4.0); 6-22	0.67
Emotional discharge	3.4 (3.3)	4.1 (3.2)	0.62	0.58	10.6 (3.5); 6-20	0.69
Dysregulation Inventory (n = 21)						
Affective dysregulation	NA (not available)		0.89 ^a		17.7 (10); 3-50	0.91
Behavioral dysregulation	NA		0.93 ^a		18.4 (10.1); 0-62	0.88
Cognitive dysregulation	NA		0.86 ^a		28.4 (9.4); 4-53	0.88
Cook Medley Hostility Scale (n = 22)	NA		0.86		82.9 (8.1); 62-98	0.85
Family Relations Index (n = 25)						
Cohesion	NA		0.78		10.8 (1.3); 9-16	0.67
Agreeableness	NA		0.69		11.8 (2.0); 9-18	0.60
Conflict	NA		0.61		16.0 (2.1); 9-18	0.70
Total score	9.91 (3.82) ^b		NA		6.6 (4.0); 1-22	NA
Dyadic Adjustment Scale (n = 24)	114.8 (17.8) ^c		0.96		126.8 (14.5); 91-154	0.79
Lubben Social Network Scale (n = 27)	NA		0.78		34.3 (7.0); 13-49	0.69

^a Data from parents of adolescents.

^b Norm for kidney recipients of deceased donors.

^c Norm for married couples (most subjects who completed the Dyadic Adjustment Scale were married).

with existing evidence about adherence in this population to improve outcomes and survival rates among liver transplant recipients.

Our sample is generally comparable to the UPMC population of liver transplant recipients, but generalizability of our results to the national population may be somewhat limited. Recipients at UPMC and in our study are somewhat older, less racially diverse, and receive a larger percentage of living donor organs than the national population. It would have been informative to compare patients in our sample with patients who were eligible but either refused or were not contacted by clinical staff; privacy regulations prevent access to that data. It is noteworthy that all but one of the minority patients who were eligible for the study have been enrolled and that more than 50% of our patients received a transplant for disease generally precipitated by patterns of behavior.

Medical and psychiatric health history was obtained in interview and from medical records, data from both sources, including history of substance abuse, were generally congruent except for length of abstinence before transplantation. Policy at the Starzl Transplant Institute and other centers requires a 6-month period of abstinence before transplantation, and all candidates in this sample met that requirement according to medical records. Two of our recipients stated (after transplantation) that they had abstained from alcohol for less than 6 months, 2 others stated they had abstained from drug use for less than 6 months. This inconsistency may be explained by the fact that pretransplant abstinence from both alcohol and drugs was documented with blood tests; because alcohol and most intravenous drugs are detectable in blood samples for a relatively short period, use may not have been detected by clinicians. Candidates are

aware of the abstinence requirement and that detectable levels of alcohol and drugs are short lived; they are therefore less likely to disclose use to clinicians before transplant than they are to researchers after transplant.

The stress of personal illness elicits more reliance on both approach and avoidant coping styles, particularly among problem drinkers.³⁸ Mean scores for our sample were higher than for the normative sample on all coping scales. Although most coping studies report the predominant style, use of both styles of coping, particularly in stressful situations, is considered adaptive.²⁸ Fifteen (17%) of our recipients used what might be considered a “balanced” style of coping, relying on approach and avoidant strategies with approximately the same frequency when dealing with transplant-related problems. This finding deserves more intensive exploration, particularly with regard to adherence and health outcomes in this population. Our sample mean on the perception of family environments, more negative than the normative group, is also somewhat consistent with prior studies³⁴ of families under stress, although little is known about family environments among organ transplant recipients. This finding may seem incongruent with the higher than normative support of the primary caregiver but can be explained by some evidence that, although families often become more conflicted, couples sometimes become closer when dealing with serious illness.³⁹

Although liver transplant recipients who receive a transplant for alcoholic liver disease are more likely than others to resume drinking,⁹⁻¹² few do, and neither pretransplant sociodemographic factors nor history of abuse is predictive of relapse.³⁰ These results extend our earlier research on psychological characteristics among military veterans who were candidates for liver transplantation.⁴⁰ In that study, candidates for liver transplant with a positive history of substance abuse used less adaptive coping styles and endorsed significantly higher levels of trait personality characteristics that underlie the behavioral and decisional patterns found in this study.

Limitations

Limitations of this study include the possibility of sample bias, due in part to difficulty recruiting participants. Some eligible recipients were too ill to approach during hospitalization and were discharged to skilled care facilities, then returned infrequently to the UPMC outpatient clinic. Recipients who refused at either the point of clinician or researcher contact were often overwhelmed with the complexity of the posttransplant regimen and reluctant to take on another responsibility. These constraints are likely to be found in many other samples of transplant recipients; they may be less pertinent to adherence research in that those potential participants most often rely on others to manage the treatment regimen. We have modified our recruitment process to

address these issues by extending the window of eligibility to include recipients who received a transplant more than 3 months previously but have not been managing their treatment regimens. We also provide contact information to those who refuse initially so that they may contact us later if they change their minds.

Further Research

This longitudinal 5-year study will continue until December 2010; recruitment began in October 2006 and will continue until December 2009. Adherence to the entire treatment regimen and health outcomes are being tracked with multiple methods during the first year after transplant and by review of medical records for the length of the study. The comprehensive data on individual and environmental resources reported here will allow us to create profiles of liver transplant recipients, examining main and interaction effects of patient and contextual factors, on trajectories of treatment adherence and health outcomes.

Although evidence-based historical predictors (length of abstinence, amount consumed, psychiatric comorbid diseases, social stability) of relapse to alcohol exist,^{41,42} little is known about behaviors and attitudes after transplant that may also contribute to recidivism in that cohort of recipients. By focusing on relatively stable characteristics that could be identified early in the transplant process, we hope to provide clinicians with guidelines to identify liver transplant candidates, regardless of their diagnosis before transplant, at risk of nonadherence and poor outcomes.

Conclusions

We hypothesize that, in addition to or in combination with known evidence-based pretransplant predictors (eg, length of abstinence, psychiatric morbidity, social stability) of relapse to alcohol,^{41,42} knowledge about behaviors and attitudes may also contribute to better health in that cohort of recipients. Some individual and environmental variables we have chosen to measure may be subject to modification with therapy (eg, coping style, impulse control). Some factors may be fixed (eg, age, access to medical care) but may be compensated for (eg, with alternative educational approaches, strengthening social and environmental supports).

We report on correlates and predictors, described here, of adherence and health outcomes at 6 months in another article⁴³; we are using those data to develop an assessment tool that will allow clinicians to target liver transplant candidates at risk of nonadherence and poor outcomes with interventions early in the transplant process. Intervention strategies that provide patients with insight into how their behaviors, attitudes, and environmental resources affect their health before and after transplant may stimulate change and improve health outcomes and survival rates in this population.

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