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Psychosocial Determinants and Outcomes of Expedited Liver Transplant Evaluations: Insights From a Retrospective Cohort Analysis

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Background. As the burden of chronic liver disease and the demand for liver transplants (LT) grows, understanding the interplay between access to care and patient outcomes is increasingly important. In this study, we explored patient characteristics and transplant outcomes in patients undergoing LT evaluations, with a focus on identifying risk factors for expedited LT evaluation. **Methods.** This single-center retrospective cohort study included patients who underwent LT evaluation for deceased donor LT between October 2017 and July 2021. Patients were categorized by context: expedited (inpatient) and routine (outpatient) LT evaluation groups. The outcome measures included waitlist status, pre-LT mortality, and post-LT complications. **Results.** Of 602 patients, 26% underwent expedited LT evaluation. Patients who underwent expedited evaluation were more likely to have a history of ascites ($P < 0.001$), hepatic encephalopathy ($P < 0.001$), and spontaneous bacterial peritonitis ($P < 0.001$) and had a higher model for end-stage liver disease sodium scores ($P < 0.001$). Both mortality (35% versus 17%, $P < 0.001$) and LT (39% versus 22%, $P < 0.001$) were more common in the expedited group; post-LT mortality was similar up to 2 y. Perceived financial concerns and social security disability income were risk factors for expedited LT evaluation. In addition, greater proximity to the LT center (95% confidence interval, 1.1-6.3; $P = 0.025$) and speaking a primary language other than English (95% confidence interval, 1.0-10.7; $P = 0.042$) were risk factors for expedited LT evaluation in women but not in men. **Conclusions.** Expedited LT evaluations were associated with more severe illness and higher pre-LT mortality; however, post-LT outcomes were comparable with those of routine evaluations. Identifying psychosocial risk factors may enhance equity and access to LT evaluations, particularly for women who face unique challenges in this context.

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Chronic liver disease affects >4 million people in the United States.[1] In patients with end-stage liver disease, liver transplant (LT) is the only definitive treatment. The demand for LT has increased in recent years owing to the increasing burden of chronic liver disease in the United States and worldwide. From 2000 to 2020, the number of LTs almost doubled[2] and the number of waitlist registrations increased by 30% as well.[3] There are professional society recommendations to refer patients with a model end-stage liver disease sodium (MELD-Na) score ≥15 or any liver-related decompensation (eg, ascites, fluid overload, variceal bleeding, encephalopathy) to be evaluated for LT.[4]

Most patients undergo a comprehensive elective, or routine, evaluation process that prepares them for transplantation. Routine evaluations have been shown to be more cost-effective without being manageable for patients as they concentrate services in multidisciplinary clinics.[5] However, liver disease is often underrecognized and can progress to overt decompensation or acute-on-chronic liver failure (ACLF).[6,7] ACLF is associated with a significant mortality risk, with some studies suggesting a transplant-free survival rate of <20%. Furthermore, a recent study showed that 14-d mortality is higher in individuals with ACLF grade 3 than in those with United Network for Organ Sharing 1a status[8] but similar post-LT outcomes compared with no ACLF.[9] Thus, these patients often require urgent evaluation for LT. A few recent

studies have shown similar results when comparing post-LT outcomes after an expedited LT evaluation.[8,10] However, data regarding the risk factors for requiring expedited LT evaluation and the long-term outcomes for this subset of patients are limited.

In recent years, there has been a surge in research exploring equity and accessibility in the field of LT. Several studies have shown that psychosocial factors, including low socioeconomic status, poor psychosocial support, and psychiatric comorbidities, are associated with reduced access to LT referrals. One recent study demonstrated that a large proportion of patients undergoing expedited evaluations are declined for inadequate psychosocial support.[11] However, the influence of psychosocial factors on the timing and urgency of evaluation has not been thoroughly explored.

This article will explore the demographic and clinical profiles of patients undergoing 2 distinct pathways of LT evaluation, expedited and routine, and assess the implications of evaluation context on short-term and long-term transplant success. Our objectives were 3-fold: (1) to compare pre-LT mortality in patients who completed expedited versus routine LT evaluation, (2) to compare peri- and post-LT outcomes in patients requiring expedited versus routine LT evaluation, and (3) to identify patient-specific psychosocial risk factors for requiring an expedited LT evaluation.

MATERIALS AND METHODS

Setting Population

We performed a single-center retrospective cohort study of patients undergoing LT (LT) evaluation at a large quaternary care and LT center. Patients with a diagnosis of advanced liver disease who were evaluated for deceased donor LT between October 2017 and July 2021 were included in this study. Patients evaluated for acute liver failure and those with previous LT were excluded. Patients were categorized by evaluation context: expedited or routine LT evaluation. Patients were considered to have routine LT evaluation if they were evaluated by the multidisciplinary transplant team in the outpatient setting. Patients were considered to have expedited LT evaluations if they were evaluated by the multidisciplinary transplant team during an inpatient admission. Patients who started evaluation as an outpatient and completed evaluation as an inpatient were not included in analyses. See **Figure S1** (**SDC,** http://links.lww.com/TXD/A727) for the patient selection diagram. This study was approved by the institutional review board with a waiver of informed consent from our medical center. The medical center evaluates an average of 160 patients for LT and performs an average of 61 deceased donor LTs per year. At the time of listing, 41.2% of patients at the center have a MELD-Na score >20.

Clinical Variables and Outcomes

Demographic variables included age, gender, race, and ethnicity. Psychosocial and socioeconomic variables included education, relationship status, income status, use of social security or disability income, perception of financial stress, housing source, primary language, birth location, drug use history, depression diagnosis, and proximity to the transplant center. Disease-related variables included causes of cirrhosis, MELD-Na score at LT evaluation, decompensation history, and receipt of routine outpatient care.

Causes of cirrhosis included alcohol-associated liver disease, nonalcoholic steatohepatitis, HCV, cholestatic liver disease (primary sclerosing cholangitis, primary biliary cirrhosis), inherited/genetic diseases (hereditary hemochromatosis, alpha-1 antitrypsin deficiency), and cryptogenic/other. For the purposes of this article, patients with transplant indication for nonalcoholic steatohepatitis cirrhosis will be referred to as having metabolic dysfunction-associated steatohepatitis cirrhosis in accordance with recent professional guidelines.[12] Clinical decompensations included hepatic encephalopathy, jaundice, ascites, hepatorenal syndrome), spontaneous bacterial peritonitis, and variceal bleeding. The primary language was classified as English or a primary language other than English (PLOE). During their psychosocial evaluation, patients who reported difficulty with finances, such as inability to pay bills or inadequate income, were categorized as having perceived financial concerns. Socioeconomic status was assessed objectively using the social deprivation index based on home zip code.

LT evaluation outcomes included LT candidacy and listing; LT candidacy was defined as acceptance by the multidisciplinary transplant team, whereas listing was defined as formal waitlist registration. Patients who died or underwent LT within 60 d of starting evaluation were considered to have an "early definitive outcome." In those who underwent LT, renal outcomes, including pre- and post-LT renal replacement therapy (RRT), were evaluated. Peri-LT metrics included postoperative complications, length of intensive care unit (ICU) stay, length of hospital stay, and discharge location. Postoperative complications included non-RRT Clavien-Dindo grade 3 or grade 4 complications.[13] The following outcomes were evaluated within the first year of LT: biopsy-proven rejection and readmissions. Readmissions within 30 d were considered early readmissions. Time to readmission was evaluated using the log-rank test. Post-LT mortality was assessed at postoperative years 1, 2, and 3. Post-LT metrics were further analyzed in expedited LT patients who underwent LT during the same admission as evaluation and included in the supplemental files.

Aims

The purpose of this study was to compare patient characteristics and outcomes in patients who required expedited compared with routine LT evaluation. We hypothesized that patients requiring expedited LT evaluations would experience increased morbidity and mortality. Our aims were to compare pre-LT mortality between LT evaluation contexts and to identify psychosocial factors associated with requiring an expedited LT evaluation.

Analyses

Patient characteristics and transplant-related outcomes were compared according to the LT evaluation location. Continuous data were assessed for normality using the Shapiro-Wilk test. Because most of the data were not normally distributed, all continuous data were reported as medians with interquartile range (IQR) and were compared using the Mann-Whitney *U* test. Categorical variables were reported as "percentages" and were compared using the Fisher exact test. Time to death and LT were compared between routine and expedited LT evaluations using Kaplan-Meier time-to-event analyses.

Logistic regression was used to evaluate for the association between evaluation context and early definitive outcomes among LT candidates and post-LT mortality among LT recipients. Associations were reported as adjusted odds ratios (ORs) with 95% confidence intervals (95% CIs). Multivariable Cox proportional hazard regression with a priori selection of covariates was conducted to assess for an association between LT evaluation context and (1) death and (2) receipt of LT. Associations were reported as adjusted hazard ratios with 95% CIs. Patients were censored at the last known well, waitlist removal, and at the date of transplant or death, respectively.

To identify psychosocial variables associated with expedited LT evaluation, we used multivariate logistic regression to assess each variable after adjusting for age and MELD-Na. Associations were reported as ORs with 95% CIs and were evaluated using logistic regression. Study data were collected from the institution's electronic medical records and managed using a 255-field form created with REDCap's electronic data capture tools.[14,15] All statistical analyses were conducted using SPSS version 29. The threshold for statistical significance was set at $P < 0.05$.

RESULTS

Patient Characteristics

In total, 602 patients were included in this study (Table 1). One in 4 patients (26%; n = 159) underwent expedited LT evaluation. Patients with expedited LT evaluation were similar in age ($P = 0.323$), body mass index (BMI; $P = 0.307$), race ($P = 0.505$), and cause of disease ($P = 0.428$) to those undergoing routine evaluations. More patients in the expedited group were women, although this did not meet statistical significance ($P = 0.070$). Before evaluation, patients with expedited LT evaluation were more likely to have hepatic encephalopathy ($P < 0.001$), jaundice ($P < 0.001$), and spontaneous bacterial peritonitis ($P < 0.001$), whereas variceal bleeding history did not differ ($P = 0.495$). Refractory ascites requiring scheduled outpatient paracenteses were also more common in the expedited group (27% versus 15%, $P < 0.001$). At the time of evaluation, patients who completed expedited evaluation had significantly higher MELD-Na scores ($P < 0.001$) and 84% of patients had a MELD-Na score ≥20 compared with 17% in the routine group.

Pretransplant Outcomes

Evaluation Outcomes

Most patients were approved as candidates for LT, with no differences between expedited and routine evaluations (92% versus 87%, $P = 0.087$; Table 2). However, patients undergoing expedited evaluation were less likely to be formally listed for LT compared with routine evaluations (75% versus 85%, $P = 0.005$). The median number of days from evaluation to listing was significantly shorter in the expedited group (11 d [IQR, 7–24] versus 51 d [IQR, 31–92], $P < 0.001$).

Mortality

In all patients, 2-y mortality rate was 20%. Mortality was significantly higher in patients who completed expedited compared with routine LT evaluation (36% versus 14%, $P < 0.001$; Figure 1). The median time to death (17 versus 311 d, $P < 0.001$) was significantly shorter in the expedited group. The expedited evaluation was associated with lower survival over time overall and on subgroup analyses in patients with both MELD-Na scores <20 (log-rank $P < 0.001$) and MELD-Na scores ≥20 (log-rank $P < 0.001$; Figure 2). On multivariable analyses with covariates including age, BMI, time from referral to evaluation, gender, MELD-Na, cause of disease, and blood type, expedited evaluation was associated was a 1.9-fold higher risk of pre-LT mortality compared with routine evaluation (95% CI, 1.06-3.23; $P = 0.031$; Table 3). Time-to-event analyses in listed patients only are shown in **Figure S2A** (**SDC,** http://links.lww.com/TXD/A727).

Transplant

Twenty-four percent of patients received an LT within 2 y of evaluation. Patients who completed expedited evaluation were more likely to receive an LT compared with patients who completed routine LT evaluation (38% versus 19%, $P < 0.001$). On multivariable regression controlling for age, BMI, gender, MELD-Na, cause of disease, and blood type, expedited evaluation was again associated with a 1.8-fold higher risk of receiving an LT (95% CI, 1.07-3.00; $P = 0.025$; Table 4). Time-to-event analyses in listed patients only are shown in **Figure S2B** (**SDC,** http://links.lww.com/TXD/A727).

Early Definitive Outcomes

Over 50% of patients who underwent expedited evaluation experienced an early definitive outcome (death or transplant within 60 d). In contrast, only 2% of patients who underwent routine evaluation experienced an early definitive outcome ($P < 0.001$). This was significant in bivariate regression models between subgroups of patients with MELD-Na score <20 ($P < 0.001$) and MELD-Na score ≥20 ($P < 0.001$). On multivariable analyses, expedited evaluation was associated with 6.7-fold higher odds of death or transplant within 60 d (95% CI, 2.5-17.8; $P < 0.001$; **Table S1, SDC,** http://links.lww.com/TXD/A727). Notably, after excluding patients with early definitive outcomes (n = 92), there was no longer a difference in LT rate in patients who completed expedited and routine evaluations (20% versus 18%, $P = 0.677$), but differences in survival persisted (25% versus 14%, $P = 0.010$).

Transplant-related Outcomes

Peri-LT Outcomes

A total of 143 patients underwent transplantation within 2 y of LT evaluation (Table 5). During their LT admission, patients with expedited evaluation were more likely to be admitted to the ICU (38% versus 11%, $P < 0.001$), when on RRT (37% versus 8%, $P < 0.001$), when on vasopressors (28% versus 10%, $P = 0.004$), and when mechanically ventilated (13% versus 1.2%, $P = 0.003$). This difference persisted when excluding expedited patients who were evaluated and underwent LT in the same admission (n = 24), including ICU admission (28% versus 11%, $P = 0.021$), RRT (25% versus 8%, $P = 0.015$), vasopressors (28% versus 10%, $P = 0.047$), and mechanical ventilation (8% versus 1%, $P = 0.011$). Patients with expedited LT evaluation also had higher MELD-Na scores at the time of LT ($P < 0.001$). With respect to donor characteristics, patients with expedited LT evaluation received fewer organs from a donor older than 60 y (5% versus 20%, $P = 0.013$), but more from a donor of the opposite sex (48% versus 32%, $P = 0.062$). Other donor characteristics such as BMI > 30 ($P = 0.208$), steatosis >30% ($P = 0.358$),

TABLE 1.

Patient characteristics by evaluation context

	Routine (N = 443)	Expedited (N = 159)	Total (N = 602)	*P*
Age	59.0 (50.0–64.0)	59.0 (54.0–64.0)	59.0 (51.0–64.0)	0.323
BMI	28.6 (24.6–33.6)	30.1 (24.1–36.1)	28.8 (24.5–34.4)	0.307
MELD-Na score	11.0 (8.0–18.0)	28.0 (23.0–32.0)	15.0 (9.0–23.0)	<0.001
SDI	–0.29 (–1.03 to 0.70)	–0.47 (–1.14 to 0.60)	–0.3733 (–1.09 to 0.64)	0.125
Gender				0.070
Women	34.1%	42.1%	36.2%	
Men	65.9%	57.9%	63.8%	
Ethnicity				0.441
Hispanic	11.5%	13.8%	12.1%	
Non-Hispanic	88.5%	86.2%	87.9%	
Race				0.505
Black	2.9%	1.3%	2.5%	
Asian	2.5%	2.5%	2.5%	
White	83.7%	80.5%	82.9%	
Other/not reported	10.9%	15.7%	12.2	
Cause				0.428
Alcohol	48.1%	50.9%	48.8%	
MASH	23.7%	23.9%	23.8%	
HCV	16.0%	10.1%	14.5%	
AILD	6.1%	7.5%	6.5%	
Other	6.1%	7.5%	6.5%	
HCC				0.004
No	84.7%	93.7%	87.0%	
Yes	15.3%	6.3%	13.0%	
Proximity				0.154
0–49 miles	67.3%	61.0%	65.6%	
≥50 miles	32.7%	39.0%	34.4%	
Referring provider				<0.001
Primary care	5.2%	3.1%	4.7%	
Inpatient physician	4.7%	75.5%	23.4%	
Outpatient GI	90.1%	21.4%	71.9%	
Blood type				0.026
Type A	40.4%	32.1%	38.2%	
Type B	10.2%	18.9%	12.5%	
Type O	46.0%	45.9%	46.0%	
Type AB	3.4%	3.1%	3.3%	
Prior decompensations				
Ascites	71.8%	91.8%	77.1%	<0.001
Encephalopathy	51.5%	71.7%	56.8%	<0.001
Variceal bleed	29.8%	32.7%	30.6%	0.495
Jaundice	30.8%	67.3%	40.4%	<0.001
Spontaneous bacterial peritonitis	6.6%	22.6%	10.8%	<0.001
Hepatorenal syndrome	3.4%	32.7%	11.1%	<0.001
Transjugular intrahepatic shunt	7.0%	7.3%	7.1%	0.921
Laboratory evaluation				
WBC, $\times 10^3/\mu L$	5.7 (4.0–7.4)	8.0 (5.3–12.0)	6.1 (4.3–8.3)	<0.001
Hematocrit, %	35.6 (31.5–40.0)	25.8 (23.3–30.0)	33.3 (28.0–38.7)	<0.001
Platelets, $\times 10^3/\mu L$	109 (77–162)	95 (61–134)	106 (73–158)	0.001
Albumin, g/dL	3.5 (3.0–4.0)	3.0 (2.6–3.5)	3.3 (2.9–3.9)	<0.001
AST, U/L	39 (28–53)	50 (31–75)	41 (30–59)	<0.001
ALT, U/L	25 (17–36)	27 (17–43)	25 (17–38)	0.272
BUN, mg/dL	15 (11–21)	33 (21–56)	18 (12–28)	<0.001
Creatinine, mg/dL	0.9 (0.7–1.1)	1.7(1.1–2.6)	0.94 (0.74–1.38)	<0.001
Sodium, mEq/L	136 (134–139)	132 (127–137)	136 (132–138)	<0.001
Total bilirubin, mg/dL	1.4 (0.8–2.8)	5.5 (2.4–12.1)	1.9 (1.0–4.6)	<0.001
INR	1.2 (1.1–1.3)	1.65 (1.3–2.1)	1.2 (1.1–1.5)	<0.001

AILD, autoimmune liver disease; ALT, alanine transaminase; AST, aspartate transaminase; BMI, body mass index; BUN, blood urea nitrogen; GI, gastroenterology; HCC, hepatocellular carcinoma; HCV, hepatitis C virus; INR, international normalized ratio; MELD-Na, model for end-stage liver disease-sodium; SDI, social deprivation index; WBC, white blood cell.

TABLE 2.

LT evaluation outcomes in patients undergoing expedited and routine LT evaluation

	Routine (N = 443)	Expedited (N = 159)	*P*
LT candidate	86.7%	91.8%	0.087
Listed for LT	84.9%	74.8%	0.005
Overall mortality	14.0%	35.8%	<0.001
Reason not listed			
Patient died	11.9%	70.0%	<0.001
Psychosocial	9.0%	2.5%	0.191
Medically too sick	7.5%	2.5%	0.280
Patient preference	9.0%	0.0%	–
Substance use	17.9%	2.5%	0.018
Medical contraindication	17.9%	0.0%	–
Medically too well	19.4%	2.5%	0.012
Lost to follow-up	7.5%	20.0%	0.026
Cause of death			0.652
Multiorgan failure	71.0%	78.9%	0.317
Hemorrhage	3.2%	1.8%	0.609
Hospice, natural death	8.1%	7.0%	0.829
COVID pneumonia	3.2%	1.8%	0.609
Unclear cause	19.5%	10.3%	0.246
Presumed cardiovascular	4.8%	0.0%	–
Found down at home	6.5%	0.0%	–
Died at outside hospital	1.6%	5.3%	0.270
No records on file	1.6%	5.3%	0.270

LT, liver transplant.

and hepatitis C positivity ($P = 0.701$) did not differ between groups. During LT, expedited patients required higher volumes of red blood cell ($P < 0.001$), platelet ($P = 0.021$), and plasma ($P < 0.001$) transfusions.

Post-LT Outcomes

The median number of days in the ICU after LT was similar in each group (7 versus 6 d, $P = 0.189$), but the total post-LT hospital stay was longer in patients who completed expedited LT evaluation (17 versus 13 d $P = 0.002$). Immediate post-LT RRT group was more common in the expedited group (44% versus 17%, $P < 0.001$); however, RRT on a postoperative day 30 did not differ between the groups (15% versus 9%, $P = 0.239$). Among those who did not require RRT before transplantation, there were no differences in immediate postoperative RRT (22% versus 15%, $P = 0.340$) or RRT at 30 d between the groups (3% versus 5%, $P = 0.509$).

Twenty-five percent of patients (n = 36) experienced a serious postoperative complication, including 7 patients who died during the same admission as LT. The most common complication was bleeding with resultant hematoma requiring operative intervention (n = 21). The rate of post-LT complications was similar in patients who completed expedited and routine LT evaluation (28% versus 23%, $P = 0.459$), including no differences in death during the same hospitalization (2% versus 7%, $P = 0.175$). There were no differences in the proportion of patients who were discharged directly to home (48% versus 49%, $P = 0.827$), an acute care hospital (12% versus 14%, $P = 0.680$), or an inpatient rehabilitation facility (12% versus 20%, $P = 0.232$), although there was a trend where more patients who completed expedited LT evaluation discharged to a long-term care facility after LT hospital admission (29% versus 17%, $P = 0.096$).

Most patients (77%) were admitted to the hospital at least once in the first year post-LT. The median number of readmissions (2 versus 1, $P = 0.239$) was similar between groups. A similar proportion of patients in each group had an early (<30 d) readmission (42% versus 46%, $P = 0.720$). The number of days from LT date (log-rank $P = 0.501$) and discharge date (log-rank $P = 0.682$) to readmission were similar in patients who completed expedited and routine LT evaluations. Among those with alcohol-associated liver disease, 7% of patients returned to drinking after LT without differences between groups (5% versus 7%. $P = 0.653$). Of those who discharged from their LT admission, there were no differences in post-LT mortality at 6 mo (2% versus 4%, $P = 0.451$), 1 y (5% versus 10%, $P = 0.261$), or 2 y (10% versus 16%, $P = 0.326$) between expedited and routine LT evaluations. Table 5 summarizes the peri- and post-LT metrics. We repeated post-LT analyses in the subset of expedited patients who were evaluated and transplanted during the same admission compared with routine evaluation in **Table S2** (**SDC,** http://links.lww.com/TXD/A727).

Psychosocial Risk Factors for Expedited LT Evaluation

Nearly all patients (99%) had insurance at the time of LT evaluation. There was no association between evaluation context and insurance type, including private insurance (33% versus 36%, $P = 0.501$), Medicare (24% versus 18%, $P = 0.104$), Medicaid (30% versus 30%, $P = 0.756$), and dual coverage (14% versus 16%, $P = 0.397$). The median social deprivation index was 35 (IQR, 16–69) in patients who completed expedited evaluation compared with 44 (IQR, 18–72) in patients who completed routine evaluation ($P = 0.125$). However, patients undergoing expedited LT evaluation were more

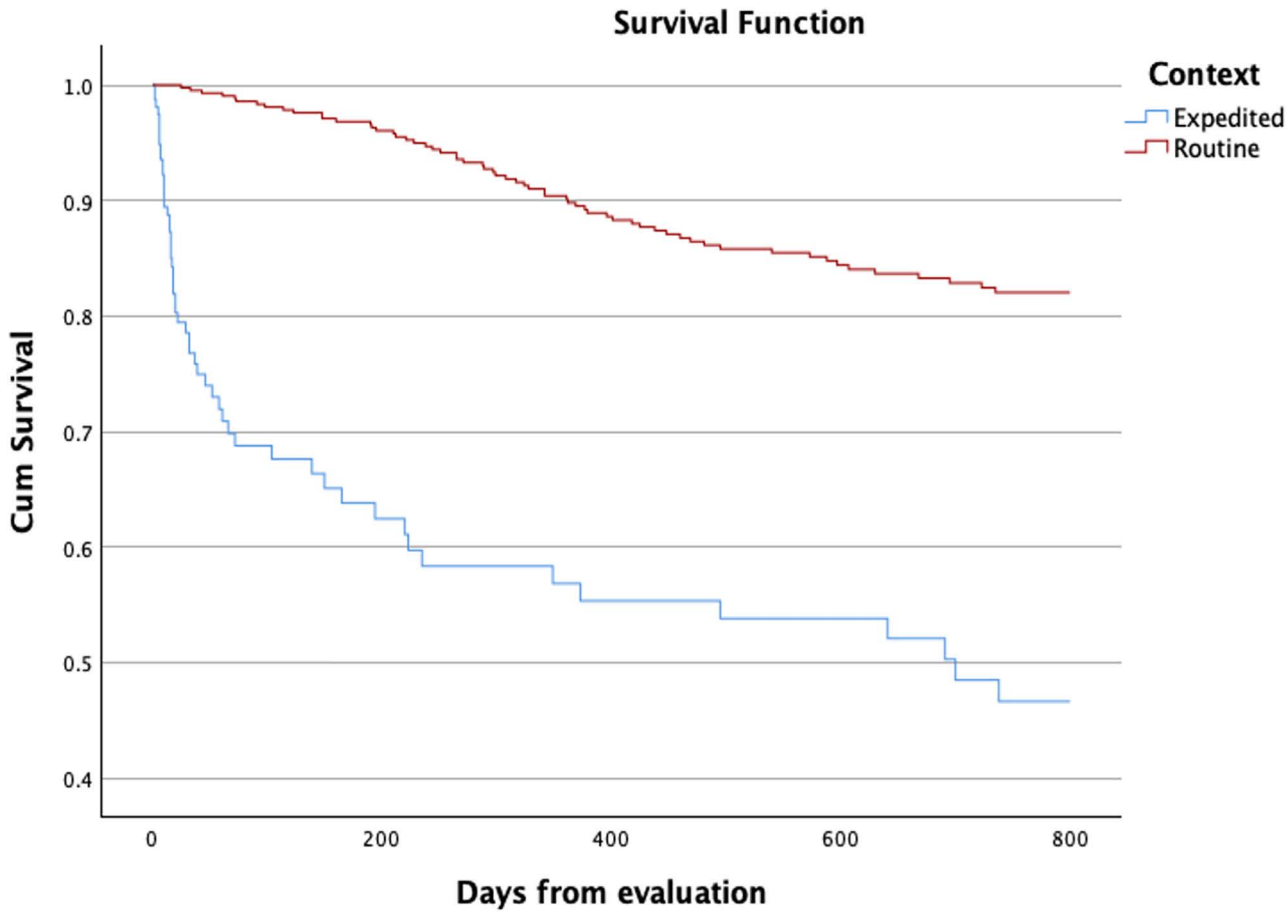

FIGURE 1. Transplant-free survival of >2 y after initiation of LT evaluation by evaluation context. The median time to death was 18 d (IQR, 9–87) and 368 d (IQR, 227–667) for expedited and routine evaluations, respectively. Censoring was performed at the time of LT or at the last follow-up. Graphed using SPSS Life Tables with time intervals of 1 d. IQR, interquartile range; LT, liver transplant.

likely to speak a PLOE (18% versus 12%, $P = 0.036$) and receive social security disability income (68% versus 44%, $P < 0.001$); they were also less likely to have a military service history (6% versus 14%, $P = 0.014$). On subgroup analyses, women undergoing expedited LT evaluation were more likely to have a long-term partner (66% versus 49%, $P = 0.023$) and to live with family (84% versus 68%, $P = 0.018$), although these failed to reach significance in multivariable analyses (Table 6; **Table S3, SDC,** http://links.lww.com/TXD/A727).

On multivariable analyses, perceiving financial difficulty (adjusted OR [aOR] 2.1; 95% CI, 1.1-4.1; $P = 0.025$), military history (aOR 0.3; 95% CI, 0.1-0.9; $P = 0.038$), and social security disability income (aOR 2.1; 95% CI, 1.2-3.6; $P = 0.011$) were associated with requiring expedited LT evaluation (Table 6). On gender-stratified analyses, several factors were associated with the need for expedited LT evaluation in women that were not identified in men. In women, expedited LT evaluation was associated with 2.7 times higher odds of living ≥50 miles from the LT center (95% CI, 1.1–6.3; $P = 0.025$) and 3.2 times higher odds of speaking a PLOE (95% CI, 1.0–10.7; $P = 0.042$). Notably, 37% of women candidates who spoke a PLOE experienced death or transplant within 60 d of LT evaluation compared with 19% of women who primarily spoke English ($P = 0.037$), 14% of men who primarily spoke English ($P = 0.002$), and 18% of men who spoke a PLOE ($P = 0.068$). Similarly, more women LT candidates who lived >50 miles from the LT center experienced death or transplant compared with others (33% versus 16%, $P = 0.024$).

DISCUSSION

In this study, we explored the clinical characteristics and outcomes of patients with end-stage liver disease who underwent expedited LT evaluation compared with routine LT evaluation. As expected, patients undergoing expedited LT evaluation were more critically ill at the time of evaluation and transplantation compared with those undergoing routine LT evaluation. Despite this, we observed similar short- and long-term post-LT outcomes between the groups. We also identified psychosocial and gender-based predictors of expedited evaluation that are relevant for improving equity and accessibility to transplants.

With respect to clinical status, patients in the expedited cohort were notably sicker, with a higher median MELD-Na (28 versus 11) and more features of ACLF such as jaundice, encephalopathy, and renal dysfunction requiring RRT. Patients in the expedited LT group experienced both a higher LT and pre-LT mortality rate compared with patients in the routine group, which was most pronounced in the first 60 d after listing. This relationship was significant when adjusting for MELD-Na on multivariable analyses and was also significant when stratifying patients by MELD-Na score <20 and ≥20. After 60 d, the transplant rate equalized, but the pre-LT

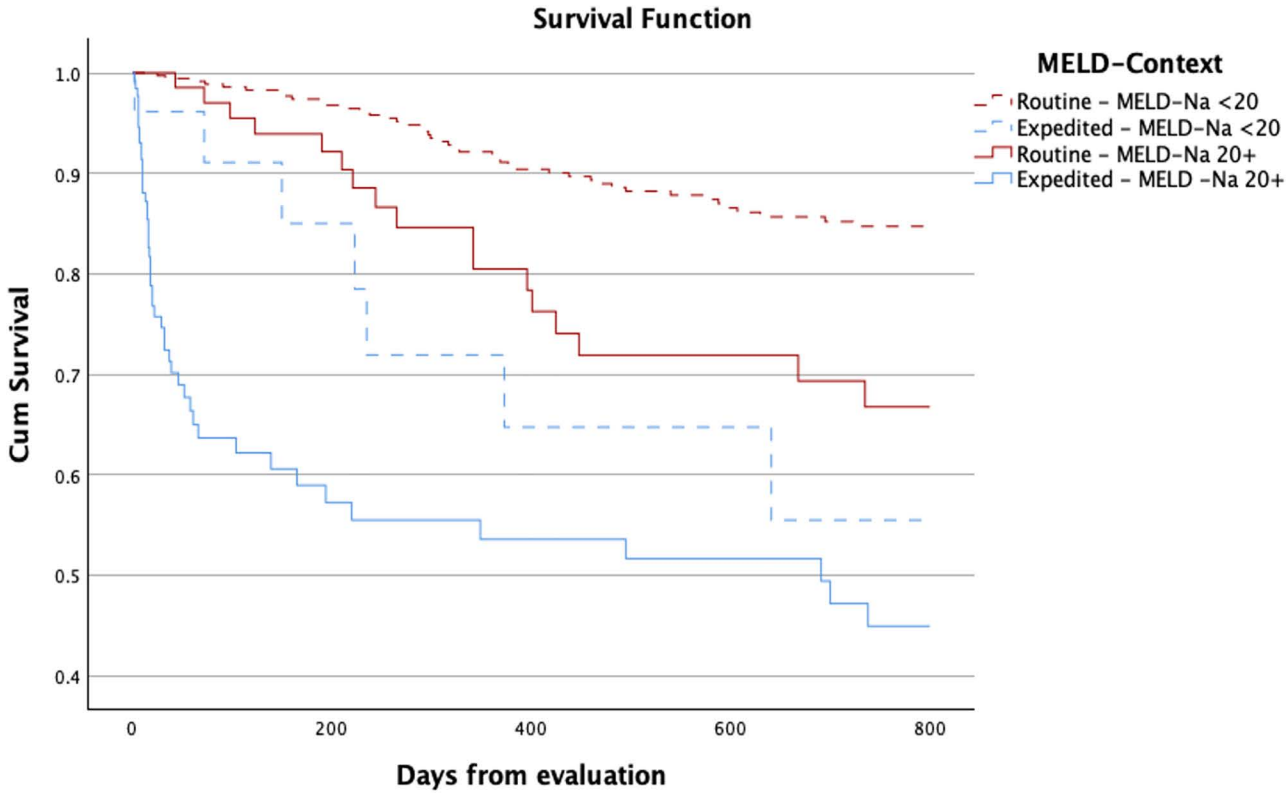

FIGURE 2. Transplant-free survival of >2 y after initiation of LT evaluation stratified by evaluation context and MELD-Na score (<20 and ≥20). Expedited evaluation was associated with lower survival in patients with a MELD-Na score <20 (log-rank $P < 0.001$) and MELD-Na score ≥20 (log-rank $P < 0.001$). Censoring was performed at the time of LT or at the last follow-up. Graphed using SPSS Life Tables with time intervals of 1 d. LT, liver transplant; MELD-Na, model for end-stage liver disease-sodium.

TABLE 3.

Multivariable analyses for all-cause pre-LT mortality in candidates for DDLT

Variable	aHR	95% CI	*P*
Age, y	1.031	1.01-1.05	0.002
BMI, mg/kg^2	1.049	1.03-1.08	<0.001
MELD-Na score	1.062	1.04-1.09	<0.001
Evaluation context			
Routine	Reference	Reference	Reference
Expedited	1.846	1.06-3.23	0.031
Patient gender			
Woman	Reference	Reference	Reference
Man	1.026	0.71-1.49	0.894
Ethnicity			
Non-Hispanic	Reference	Reference	Reference
Hispanic	0.971	0.57-1.67	0.916
Referral to evaluation			
0–15 d	Reference	Reference	Reference
>15 d	0.995	0.63-1.58	0.983
Cause			0.116
ALD	Reference	Reference	Reference
MASH	0.803	0.50-1.30	0.370
HCV	1.071	0.61-1.87	0.810
AILD	2.098	1.07-4.13	0.032
Other	1.319	0.67-2.59	0.420

aHR, adjusted hazard ratio; ALD, alcohol-associated liver disease; AILD, autoimmune liver disease; BMI, body mass index; CI, confidence interval; DDLT, deceased donor liver transplantation; HCV, hepatitis C virus; LT, liver transplant; MASH, metabolic dysfunction–associated steatohepatitis; MELD-Na, model for end-stage liver disease-sodium.

TABLE 4.

Multivariable analyses for predictors of transplantation

Variable	aHR	95% CI	*P*
Age, y	1.019	1.00-1.04	0.042
BMI, mg/kg^2	1.000	0.97-1.03	0.997
MELD-Na score	1.075	1.05-1.10	<0.001
Evaluation context			
Routine	Reference	Reference	Reference
Expedited	1.795	1.08-2.99	0.025
Patient gender			
Woman	Reference	Reference	Reference
Man	1.190	0.82-1.73	0.361
Ethnicity			
Non-Hispanic	Reference	Reference	Reference
Hispanic	0.558	0.37-0.93	0.023
Referral to evaluation			
0–15 d	Reference	Reference	Reference
>15 d	0.999	0.99-1.01	0.690
Cause			0.015
ALD	Reference	Reference	Reference
MASH	0.778	0.48-1.27	0.316
HCV	1.840	1.11-3.06	0.019
AILD	1.860	0.95-3.63	0.069
Other	1.608	0.83-3.13	0.163
Blood type			<0.001
Type A	Reference	Reference	Reference
Type B	1.390	0.85-2.27	0.187
Type O	0.799	0.54-1.17	0.250
Type AB	3.395	1.73-6.65	<0.001

aHR, adjusted hazard ratio; ALD, alcohol-associated liver disease; AILD, autoimmune liver disease; BMI, body mass index; CI, confidence interval; HCV, hepatitis C virus; MASH, metabolic dysfunction–associated steatohepatitis; MELD-Na, model for end-stage liver disease-sodium.

mortality rate remained higher in the expedited patient group. This is likely explained by the narrow "transplant window" and the high waitlist mortality previously described in these patients.[16,17] At the end of 2 y, only 13% of the patients who completed expedited evaluation remained candidates awaiting transplantation, which highlights the importance of identifying risk factors for expedited evaluation.

For those who underwent LT, we noted comparable early post-LT outcomes between those who underwent expedited and routine LT evaluation. This included a similar number of days in the ICU and a number of readmissions in the first year. Although immediate postoperative RRT was more prevalent among patients who underwent expedited evaluations, these patients also had higher estimated blood loss and required higher volumes of intraoperative transfusion, justifying the need for short-term RRT. One-year post-LT mortality did not differ in those who completed expedited LT evaluation, which is similar to prior studies showing comparable post-LT outcomes, but this is the first to follow patients for 2 y and beyond. These findings build on the literature supporting expedited evaluations in appropriately selected patients, which can have favorable outcomes.[8,10] Furthermore, our results demonstrate that barriers to outpatient LT evaluation should not preclude inpatient evaluation in patients with low or high MELD-Na scores as this may both lower risk of death and increase access to LT in a population with excellent post-LT survival.

We identified several psychosocial predictors of expedited transplant evaluation. Patients with financial concerns and those receiving social security income were more likely to undergo expedited evaluations than routine evaluations. Financial concerns were more frequently documented among women. This finding reinforces that lower financial stability and social support are significant barriers to establishing care at a transplant center before acute decompensation. It is interesting to note that expedited evaluations were common among women with long-term partners and living with families. Lack of psychosocial support remains a major reason patients are considered to be a poor candidate for LT.[11] However, metrics of social support may not be reliable predictors of post-LT outcomes.[18] The gender-based discrepancy in psychosocial support observed in our study may suggest that ideals of adequate psychosocial support may affect women more than men and thus should be scrutinized as a contraindication to transplant.

Prior studies have shown that increased proximity to a transplant center is associated with a lower likelihood of being listed and higher waitlist mortality.[19,20] In general, the relationship between proximity and LT outcomes has been linked to infrequent follow-ups, resulting in delayed referrals or difficulties in maintaining care. We observed similar rates of expedited LT evaluation, waitlisting, and transplantation in patients who lived ≤50 miles from the LT center compared with those who lived >50 miles from the center. However, in stratified analyses, women living ≥50 miles from the transplant center were more likely to require expedited LT evaluation than women living ≤50 and men living ≥50 miles from the LT center. Similarly, women who spoke English as a second

TABLE 5.

Peri- and posttransplant metrics

	Routine (N = 83)	Expedited (N = 60)	*P*
MELD-Na scores median (IQR)	24 (15-30)	32 (27-37)	<0.001
ICU	10.8%	38.3%	<0.001
Ventilated	1.2%	13.3%	0.003
Vasopressors	9.6%	28.3%	0.004
Transplanted for ALD	39.8%	60.0%	0.017
Donor characteristics			
Donor age ≥60 y	19.5%	5.1%	0.013
Donor HCV+	8.5%	6.8%	0.701
Donor BMI ≥30 mg/kg^2	40.2%	29.8%	0.208
Donor steatosis ≥30%	6.1%	10.3%	0.358
Donor mismatch	32.1%	48.1%	0.062
Intraoperative fluids			
Blood transfusion, median (IQR) mL	2236 (1545-3163)	3299 (2238-4579)	<0.001
Plasma transfusion median (IQR) mL	2156 (1456-2960)	3613 (1915-5105)	<0.001
Platelets transfusion, median (IQR) mL	414 (208-800)	694 (438-1033)	0.021
Urine output, median (IQR) mL	589 (323-1063)	375 (100-900)	0.002
Postoperative metrics			
Ventilator time, d	1 (1-5)	1.5 (1-4)	0.902
ICU time, median (IQR) ,d	6 (3-10)	7 (4-14)	0.189
Length of stay, median (IQR) d	13 (8-18)	17 (12-25)	0.002
Surgical complications			
Any complication	22.9%	28.3%	0.459
Grade 3	8.4%	15.0%	0.219
Grade 4	7.2%	11.7%	0.362
Grade 5	7.2%	1.7%	0.128
Renal outcomes			
Any pre-LT RRT	8.4%	36.7%	<0.001
Any post-LT RRT	16.9%	44.1%	<0.001
30-d post-LT RRT	8.6%	15.0%	0.239
Discharge location			0.317
Acute care hospital	14.3%	11.9%	0.680
Inpatient rehab facility	19.5%	11.9%	0.232
Long-term care facility	16.9%	28.8%	0.096
Direct to home	49.4%	47.5%	0.827
Postdischarge metrics			
Within 30 d	45.5%	42.4%	0.720
Within 60 d	45.5%	50.8%	0.533
Readmitted with 1 y	77.9%	76.3%	0.820
Rejection within 1 y	19.0%	30.4%	0.126
Mortality–all patients			
30-d mortality	6.0%	3.3%	0.462
6-mo mortality	10.8%	3.3%	0.096
1-y mortality	16.9%	6.7%	0.127
2-y mortality	22.2%	11.7%	0.326
Mortality–if discharged			
30-d mortality	1.3%	1.7%	0.849
6-mo mortality	3.9%	1.7%	0.451
1-y mortality	10.4%	5.1%	0.261
2-y mortality	16.0%	10.2%	0.326

ALD, alcohol-associated liver disease; BMI, body mass index; HCV, hepatitis C virus; ICU, intensive care unit; LT, liver transplant; MELD-Na, model for end-stage liver disease-sodium; RRT, renal replacement therapy.

language had nearly 3-fold higher odds of requiring expedited evaluation; this translated to significantly higher mortality compared with the rest of the cohort and highlights the importance of this topic for gender equity. These findings suggest that psychosocial factors, such as primary language and distance to an LT center, may be underestimated prognostic determinates in the context of LT. The reasons why these groups are more likely to require inpatient evaluation extend beyond the scope of this study, although it may be related to delayed LT referral or reflect the risk of ACLF as the number of days from referral to listing did not differ in these patients. In either case, we believe that recognizing psychosocial factors

TABLE 6.

Association of Psychosocial Factors with Expedited LT evaluation

	All		Women		Men	
	aOR (95% CI)	*P*	aOR (95% CI)	*P*	aOR (95% CI)	*P*
White	0.988 (0.497-1.966)	0.974	0.440 (0.168-1.432)	0.172	1.635 (0.647-4.131)	0.299
Hispanic ethnicity	0.874 (0.403-1.892)	0.731	2.264 (0.657-7.804)	0.196	0.505 (0.182-1.400)	0.189
Proximity >50 miles	1.177 (0.685-2.023)	0.555	2.682 (1.134-6.343)	0.025	0.618 (0.290-1.318)	0.213
Military history	0.331 (0.116-0.940)	0.038	0.939 (0.036-23.910)	0.965	0.333 (0.101-1.096)	0.070
Alcohol use	0.690 (0.398-1.198)	0.187	0.862 (0.358-2.077)	0.740	0.629 (0.305-1.298)	0.210
Any drug use	1.142 (0.635-2.055)	0.657	0.531 (0.159-1.725)	0.304	1.736 (0.841-3.387)	0.136
Did not complete HS	1.229 (0.622-2.431)	0.552	1.570 (0.529-4.662)	0.417	1.028 (0.420-2.513)	0.932
Employment: 1 mo	0.740 (0.370-1.479)	0.393	0.560 (0.147-2.124)	0.394	0.830 (0.354-1.946)	0.668
Employment: 1 y	0.765 (0.422-1.326)	0.340	0.680 (0.264-1.749)	0.423	0.912 (0.447-1.862)	0.800
Anxiety	1.480 (0.849-2.379)	0.166	1.856 (0.777-4.837)	0.164	1.079 (0.505-2.305)	0.844
Depression	1.457 (0.797-2.664)	0.221	1.150 (0.467-2.831)	0.766	1.668 (0.730-3.812)	0.225
PLOE	1.276 (0.618-2.597)	0.519	3.197 (1.004-10.185)	0.049	0.690 (0.266-1.793)	0.447
Born outside the US	1.064 (0.538-2.106)	0.858	2.421 (0.793-7.397)	0.121	0.642 (0.262-1.576)	0.333
SDI	0.944 (0.732-1.216)	0.654	0.855 (0.559-1.307)	0.470	1.006 (0.729-1.388)	0.973
Any income	1.324 (0.666-2.634)	0.424	1.671 (0.578-4.525)	0.360	1.207 (0.475-3.069)	0.693
SSDI income	2.050 (1.178-3.565)	0.010	2.251 (1.933-5.571)	0.070	1.875 (0.919- 3.829)	0.084
Stable partner	0.960 (0.559-1.649)	0.882	1.543 (0.660-3.607)	0.317	0.749 (0.368-1.527)	0.426
Lives with family	0.661 (0.358-1.219)	0.185	1.290 (0.487-3.418)	0.608	0.433 (0.192-0.978)	0.043
Financial concern	2.114 (1.098-4.067)	0.025	2.652 (0.942- 7.467)	0.065	1.721 (0.734-4.036)	0.212
Housing dependent	0.727 (0.397-1.330)	0.300	0.694 (0.272- 1.770)	0.444	0.680 (0.305-1.517)	0.366
Insurance	0.066 (0.003-1.463)	0.086	–	–	0.045 (0.098-1.069)	0.057
Insurance type (private)				0.988		0.326
Medicaid	1.449 (0.743-2.828)	0.277	1.142 (0.399, 3.270)	0.805	1.647 (0.685-3.962)	0.265
Medicare	1.212 (0.536- 2.743)	0.644	0.941 (0.247-3.578)	0.929	1.354 (0.472-3.882)	0.573
Dual coverage	0.795 (0.349-1.812)	0.584	1.149 (0.299-4.418)	0.839	0.612 (0.212-1.771)	0.365

Multivariable logistic regression models assessing each variable, adjusted for age and MELD-Na. aOR, adjusted odds ratio; CI, confidence interval; HS, high school; PLOE, Primary Language Other than English; US, United States; SSDI, social security-disability; SDI, social deprivation index.

that limit access to LT without direct association with poor post-LT outcomes is something actionable in the realm of equity. For example, providers may aim to prioritize evaluating and formally presenting patients in high-risk psychosocial groups, even if their MELD-Na is historically lower.

This study had a few important limitations. As this was a retrospective single-center study, the reported findings may not be applicable to all transplant centers. Our population was also limited with respect to racial diversity, with only 2% of the study cohort identified as Black. We used the MELD-Na scores to assess disease severity, as the study was completed before the implementation of MELD 3.0 in September 2021 (cite). Although we did control for gender, MELD 3.0 scores may provide a more comprehensive overview of transplant trends. Our posttransplant follow-up was limited to 2 y, and the outcomes between the 2 groups after this period are not known. Finally, patients referred for LT but not evaluated were not included as reasons for denial at the time of referral were not documented in our institutional database. These encounters may have provided a deeper insight into referral patterns, although this has been the subject of several previous studies. Despite these limitations, we believe that the results of this study are relevant for understanding expedited LT evaluation. Although these patients were sicker with higher mortality rates, their posttransplant course was promising. There is scope to further increase accessibility and equity among patients with liver disease, with future studies assessing gender differences in patients seeking transplant evaluations.

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