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Clinical characteristics of HIV patients being referred for liver transplant evaluation: a descriptive cohort study

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Abstract

Background—Liver transplantation (LT) is a treatment option for select human immunodeficiency virus (HIV)-infected patients with advanced liver disease. The aim of this study was to describe LT evaluation outcomes in HIV-infected patients.

Methods—All HIV-infected patients referred for their first LT evaluation at the Mount Sinai Medical Center were included in this retrospective, descriptive cohort study. Multivariable logistic regression was used to identify factors independently associated with listing.

Results—From February 2000 and April 2012, 366 patients were evaluated for LT, with 66 (18.0%) listed for LT and 300 (82.0%) not listed. Fifty-one patients (13.9%) died before completing evaluation and 85 (23.2%) were too early for listing. Reasons patients were declined for listing were psychosocial (15.8%), HIV-related (10.4%), loss to follow up (9.6%), surgical/medical (6.0%), liver-related (4.4%), patient choice (3.4%), and financial (1.6%). Listed patients were more likely to have hepatocellular carcinoma (HCC) (43.1% vs. 17.1%; $P < 0.0001$) and less likely to have hepatitis B (6.2% vs. 15.7%; $P = 0.04$) or a psychiatric history (19.7% vs. 35.2%; $P = 0.02$) than those not listed. In multivariable analysis, HCC (odds ratio [OR] 5.79; 95% confidence interval 2.97–11.28), MELD at referral (OR 1.06; 1.01–1.11), and hepatitis B (OR 0.26; 0.08–0.79) were associated with listing.

Conclusion—MELD score and HCC were positive predictors of listing in HIV-infected patients referred for LT evaluation and, therefore, timely referrals are vital in these patients. Because

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MELD is a predictor for death while undergoing an evaluation, a rapid evaluation should be performed in HIV-infected patients with a higher MELD score.

Keywords

HIV; waiting list; hepatocellular carcinoma; hepatitis B; hepatitis C; MELD score; liver transplant evaluation

Breakthroughs in antiretroviral therapy (ART) over the past decades have allowed selected human immunodeficiency virus (HIV)-infected patients with advanced liver disease to achieve favorable outcomes following liver transplantation (LT), with some differences depending on the etiology of their liver disease.

While the number of HIV-infected persons with advanced liver disease is steadily increasing, the number of donors for LT has remained relatively stable (1), and the number of LT procedures in these patients in the United States has declined from 6651 in 2006 to 6256 in 2012 (2). To optimize the use of donor organs and to ensure the best outcomes for patients, all potential LT candidates undergo a comprehensive, multidisciplinary evaluation prior to being accepted as a candidate.

We hypothesized that the rate of listing among HIV-infected patients in the post-ART era is lower than in HIV-uninfected patients and, furthermore, that reasons to not list patients, such as the lack of adequate HIV control or psychological issues, are modifiable. The aim of this study was to explore factors associated with listing and death during the evaluation process among HIV-infected patients evaluated for LT.

Patients and methods

This retrospective descriptive cohort study was conducted at The Icahn School of Medicine at Mount Sinai (ISMMS) in New York, with approval from the Program for the Protection of Human Subjects (GCO# 12-0757). The primary outcome was the percentage of evaluations that resulted in listing for LT.

Study design

All HIV-infected patients referred for LT evaluation between February 2000 and April 2012 were included. To assess if HIV-infected patients were listed in a similar proportion to HIV-uninfected patients, we calculated the proportion of HIV-uninfected patients who were listed during the study period.

All subjects were identified from a clinical referral database, which contains information on all patients referred for LT evaluation. All patients referred for LT at our center were evaluated and then discussed with a multidisciplinary team including a hepatologist, LT coordinator, nutritionist, social worker, cardiologist, transplant infectious diseases physician, and a transplant surgeon. Based on the evaluation by our social worker, patients may have also been recommended to be evaluated by a psychiatrist. Decisions by the team included to list or decline a patient, and were rendered at the weekly Recipient Review Committee (RRC). Based on the medical history, individual patients may have required further medical

(e.g., pulmonary or nephrology) evaluation. All HIV-infected patients were evaluated by a transplant infectious diseases specialist to confirm their eligibility (outlined below) for LT, recommend adjustment of ART if needed, and suggest appropriate perioperative prophylaxis, considering past infections. Data were manually extracted from electronic medical records. Data collected included baseline characteristics, such as demographics, education, and employment status; medical history, including HIV status; severity of liver disease, including Model for End-stage Liver Disease (MELD) score at referral; history of ascites, encephalopathy, and variceal bleeding; and details of LT evaluation, including duration of evaluation, type of referring provider, and whether the referring provider was from within ISMMS or external. Data regarding the decision to list or decline were obtained from the institutional transplant database. Death prior to completion of evaluation was captured. Patients were judged 'too early' if they had well-compensated liver disease (no prior decompensation). More than one reason could be given to decline a patient for listing.

During the study period (2000–2012), the eligibility criteria for LT in HIV infected patients were modified. Between 2000 and 2002, any history of opportunistic infection (OI) was considered an absolute contraindication to listing for LT (3). In 2002, eligibility criteria were further modified to exclude only patients with a history of visceral Kaposi sarcoma, lymphoma, chronic cryptosporidiosis, and progressive multifocal leukoencephalopathy. Most notably, beginning in 2004, ISMMS participated in the National Institutes of Health (NIH)-sponsored multi-site clinical trial for HIV-infected patients (NCT00074386). Patients listed between May 2004 and January 2010 were enrolled in the NIH protocol, and detailed listing criteria, along with overall results, have been published previously (4, 5). Briefly, the criteria included a CD4 count ≥ 100 cells/mm³ (or ≥ 200 with a history of OI) for >6 months and an undetectable HIV viral load for >3 months.(4) Since 2010, our center has continued to use the NIH protocol-based criteria.

For statistical purposes, patients were classified as working if they were full-time or part-time employees. Education status was categorized as those who obtained or did not obtain a college degree or more. Patients were considered to have an undetectable HIV viral load if the viral load was lower than the limit of quantification. Chronic hepatitis B was defined as the presence of a positive hepatitis B virus (HBV) surface antigen and hepatitis C was defined by the presence of hepatitis C virus (HCV) antibody. A diagnosis of acute hepatitis included viral, drug-induced, alcohol-induced, and fulminant hepatitis of any cause. We used the crude MELD value (based only on laboratory values and need for dialysis, and excluding priority points for hepatocellular carcinoma [HCC] or other MELD exception conditions) in the statistical analysis. Because some patients were lost to follow-up or died before being presented at the RRC, we used the MELD score at the time of referral. Evaluation duration was calculated from the date of referral to the date of the LT RRC meeting decision.

Statistical analysis

Median and interquartile ranges were used for descriptive statistics. For univariable analysis, Student *t*-test, Mann–Whitney *U*-test, and Kruskal–Wallis test were used for normally and not normally distributed continuous variables respectively. Bonferroni correction was used

to compare the MELD score between the different groups of outcomes. Chi-square or Fisher's exact tests were used for categorical variables.

A multivariable model was built with being listed as the dependent variable. Factors with a P -value < 0.10 in the univariable analysis were evaluated in the multivariable model. A P -value of 0.05 was considered statistically significant. Data were analyzed in SPSS (version 21, IBM, Chicago, Illinois USA).

Results

Characteristics of the cohort

Between 2000 and 2012, 366 HIV-infected patients were evaluated. Overall, only 66 (18.0%) evaluations resulted in listing for LT, compared to 42.0% of the non-HIV infected patients ($P < 0.001$) seen during the same time period (Fig. 1). Of the 66 patients who were listed, 20 (30%) were transplanted, 8 (12%) remain listed, 16 (24%) died on the list, and 22 (34%) were removed from the list (Fig. 1).

Overall, 300 (82.0%) evaluations of HIV-infected patients did not result in listing (Fig. 1). In 13.9% ($n = 51/366$) of the evaluations, the patient died before the evaluation was completed. In 23.2% ($n = 85/366$) of the evaluations, the patient was deemed too early for listing. For the remaining 164 evaluations, decisions for declining a patient included psychosocial reasons, such as lack of social support or active substance abuse ($n = 58$; 15.8%); HIV-related reasons, such as history of specific OI or uncontrolled HIV ($n = 38$; 10.4%); loss to follow up ($n = 35$; 9.6%); medical/surgical reasons, such as cancer or lung diseases ($n = 22$; 6.0%); liver-related reasons, such as HCC outside the Milan or UCSF criteria ($n = 16$; 4.4%); patient choice to decline listing ($n = 12$; 3.4%); and financial reasons ($n = 6$; 1.6%). Of note, patients who were too early were instructed to continue follow-up at our center. Four patients were subsequently re-evaluated and listed.

We did a *post-hoc* analysis of the outcomes of evaluations among 49 HBV-infected patients, of whom 4 (8.2%) were listed (6). Nine HBV-infected patients died during the evaluation process and 8 had liver disease that was considered to be too early. The remaining 28 evaluations did not result in listing for the following reasons: 8 for HIV-related reasons, 7 for psychosocial reasons, 5 for liver-related reasons, 3 lost to follow up, 3 for financial reasons, 3 patients declined to be listed, and 2 with a medico-surgical contraindications.

Impact of MELD score on outcomes

The median MELD score at referral differed among the outcomes (listed: 14.3 [9.9–18.8], death during the evaluation process: 16.2 [12.0–19.3], too early: 10.9 [8.5–14.9], not listed for other reasons: 12.7 [10.2–16.0]; $P < 0.001$). Using Bonferroni correction, patients who died during the evaluation process had a higher referral MELD score than patients declined because they were too early ($P < 0.001$), or declined for other reasons ($P = 0.001$), but did not differ from those listed ($P = 0.08$). A sensitivity analysis was performed to compare patients who were too early to list with patients who died during the evaluation process. No significant difference was seen between age, gender, CD4 T-cells count, undetectable HIV viral load, referral from a provider within our health system vs. a referral from a provider

outside of our health system, or etiology of liver disease, except for a trend toward more HBV among patients who died during the evaluation (11/47 vs. 9/84; $P = 0.053$). As expected, those who died were more likely to have a history of ascites ($P < 0.001$) or hepatic encephalopathy ($P < 0.001$).

Listed vs. non-listed univariable analysis

Baseline characteristics for the entire cohort are presented in Table 1. The median age of those listed was 52 years (interquartile range [IQR] 47–58) and not listed was 51 years (IQR 46–57). No statistically significant difference was noted for gender, race, employment status, or education level between those who were listed vs. not listed. While the association between being listed and the CD4+ T cell count was not significant (387 [269–585] vs. 333 [207–516] cells/mm³; $P = 0.09$), the HIV viral load was more likely to be not detected in listed patients compared to those not listed (86.4% vs. 74.5%; $P = 0.05$). The presence of most comorbid conditions was not different between the 2 groups, although a history of psychiatric disease was associated with a lower likelihood of listing (19.7% vs. 35.2%; $P = 0.02$).

The underlying cause of liver disease was hepatitis C in most patients (88.5%), and the majority of patients had evidence of chronic HCV infection with a detectable HCV RNA (88.7%). Presence of HCV infection was not significantly associated with being listed or not listed. The presence of HBV infection was less frequently associated with listing (6.2% vs. 15.7%; $P = 0.04$). Twenty-eight patients were dual-infected with HCV and HBV, of whom only 3 were listed. HCC was more frequently associated with being listed (43.1% vs. 17.1%; $P < 0.0001$).

Several indicators of more advanced liver disease were similar between the 2 groups. The presence of ascites (53.0% vs. 40.7%; $P = 0.07$) trended towards significance. The MELD score at the time of referral was also not significantly associated with listing (14.3 [9.9–18.8] vs. 12.7 [9.9–16.3]; $P = 0.21$).

Referral from a provider from within ISMMS vs. external did not influence the likelihood of being listed ($P = 0.62$). The specialty of the referring provider was significantly associated with listing ($P = 0.001$), with a higher proportion of patients referred by a medical or surgical oncologist being listed. No differences were seen in listing of patients who were referred by gastroenterologists, hepatologists, or infectious diseases physicians. Shorter duration of evaluation (7.2 months [IQR 2.7–12.3] vs. 9.8 [IQR 3.4–17.5]; $P = 0.06$) trended towards significance.

Listed vs. non-listed multivariable analysis

In the multivariable model (Table 2), while adjusting for duration of evaluation, the presence of HCC (odd ratio [OR] 5.79; 95% confidence interval [CI] 2.97–11.28) and a higher MELD score at time of referral (OR 1.06; 95% CI 1.01–1.11) were both associated with a higher likelihood of being listed. The presence of chronic HBV (OR 0.26; 95% CI 0.08–0.79) was associated with a lower likelihood of listing.

Discussion

LT can be a life-saving procedure in carefully selected HIV-infected patients with end-stage liver disease. In this retrospective descriptive cohort study, we report a single-center experience of HIV-infected patients referred for LT in the post-ART era. The listing rate of HIV-uninfected patients (42%) at our center is similar to the published listing rates (40–50%) at other centers (7, 8). In contrast, the listing rate in HIV-infected patients was only 18%. This listing rate is similar to that reported by Tan-Tam et al. (9) (5/23 patients; 21.7%) in their retrospective study of HIV-infected patients evaluated for LT in British Columbia, Canada.

More than a third of our patients (or 45.3% of those declined) were referred either too early or died during the transplant evaluation. This finding is similar to other studies of HIV-uninfected patients in which 24.4%–49.4% of declined patients for LT were considered too early and 13.2–24.6% died during the evaluation process (7, 8, 10). In HIV-infected patients, Tan-Tam et al. (9) reported 43.5% of their cohort died during the evaluation for LT and 17.4% of patients were considered too early.

In previously published studies of HIV-uninfected patients, the most common reasons for not listing were too early for LT (24.4–49.4%), psychosocial reasons (18.6%), HCC outside of the Milan or University of California San Francisco (UCSF) criteria (17%), medical contraindications (17.3%), and death during the evaluation process (13.2–16.2%) (7, 8, 10). Our study demonstrated similar reasons for not listing in HIV-infected patients. In our study, psychosocial reasons were a predominant reason for not listing, and were found in 19.3% (58/300) of patients not listed (or 15.8% of the overall cohort). In addition, 9.6% of all the evaluations were not completed because of a lack of follow-up.

In our cohort, patients who died during the evaluation process had a higher MELD score than those not listed, but did not differ from the MELD score of listed patients. According to a study by Ragni et al. (11), in which patient survival on the liver transplant list was analyzed, MELD score was not a good predictor of mortality in HIV-infected patients. In addition, despite a shorter survival of HIV-infected patients compared to HIV-uninfected patients, no difference in MELD score was seen between the 2 groups (11). This report is in contrast to a study by Subramanian et al. (12), where the baseline MELD score was the only independent predictor of pretransplantation mortality in a combined cohort of HIV-infected and -uninfected patients. Further studies regarding the role of MELD as a predictor of mortality in HIV-infected patients is likely warranted, to better interpret these findings.

The results of our study demonstrated that the evaluation time for LT in HIV-infected patients is long. It may also be the case that HIV-infected patients are referred for evaluation for LT later, compared to non-HIV infected patients. Better provider knowledge regarding the good prognosis of carefully selected HIV-infected patients post transplant may improve the time to referral and lead to fewer delays in initiating and completing evaluations; further studies of this are recommended.

In our study, HIV-related reasons accounted for 12.7% (38/300) of patients not being listed, explaining part of the discrepancy between HIV-infected and HIV-uninfected patients.

Murillas et al. (13) reported that 77% of HIV-infected patients were not listed for HIV-related reasons. The difference between our results is likely because of differences in inclusion criteria for LT at our center, especially with respect to a history of OIs and CD4 levels. The exclusion criteria in the Murillas study included all OIs, except tuberculosis, as absolute contraindications to transplantation, and the CD4+ T-cell count threshold used was >200 cells/mm³, unless the ratio was $>20\%$ (13). The median CD4+ T-cell count of their cohort was 202 cells/mm³, as opposed to the median CD4+ T-cell counts in the present study of 387 cells/mm³ and 333 cells/mm³ for our listed and non-listed patients, respectively. Similarly, only 42% of patients in the Murilla study had a viral load <200 copies/mL, compared to 86.4% in the listed and 74.5% in the non-listed patients in our cohort.

We were able to identify predictors of listing for LT. Referral for HCC was the factor most associated with being listed in our study. A potential reason for this association is that patients with knowledge of a newly diagnosed cancer may be more motivated to complete the evaluation process, particularly in those who meet tumor priority exception points for listing, in which a shorter time to listing can result in earlier transplantation. In addition, many patients with HCC often do not have other signs or symptoms of decompensated liver disease and, therefore, are able to be listed and transplanted without becoming too sick for transplant. The global incidence of HCC is on the rise, including in HIV-infected patients (14). Previous studies have suggested that the management of HCC in HIV-infected patients may be less optimal than in HIV-uninfected patients (15). However, recent data suggest that, since 2006, more effective HCC therapy has been utilized in HIV-infected patients (16). A recent study demonstrated no difference in HCC-free survival or overall survival between HIV-infected and HIV-uninfected patients (17). The experience with transplant for HCC in HIV patients in the United States is also favorable, potentially because these transplants occurred at earlier stages of liver disease, because of the MELD exception points given to HCC (3).

Hepatitis B was associated with a lower likelihood of listing in both univariable and multivariable analysis. In a small study, published in 2006, of 35 HIV-HBV co-infected patients referred for LT evaluation, 26% of patients were listed, 28% had a contraindication to transplant, 26% were too early, 11% died during the evaluation process, and 9% were too sick for LT (18). In our study, only 8.2% (4/49) of our HBV-infected patients were listed; 57% had a contraindication or were too sick for transplant, 16% were too early, and 18% died during the evaluation process. Differences in listing may be related to duration of newer antiviral therapies against HBV, including tenofovir-based regimens, leading to better control of underlying liver disease and less need for LT in this subgroup. In those patients who are referred for LT evaluation with underlying HBV and HIV, adherence could be a possible factor contributing to disease progression. However, the numbers in both studies are small and may be difficult to interpret.

The principal strength of this study is its size. To our knowledge, this is the largest study to identify factors associated with listing in HIV-infected LT candidates. Of the previously published studies that evaluated LT listing in HIV-infected patients, one focused on HBV, another used inclusion criteria different than those currently suggested in the United States,

and the last analyzed outcomes in only 23 patients (9, 13, 18). As LT in HIV-infected patients continues to evolve as a treatment option, a better understanding of the appropriate timing for LT and factors associated with LT are needed.

One limitation of our study is missing data. In part, this can be explained by the retrospective design of the study, but can also be explained because of the stepwise nature of an LT evaluation. For example, patients who do not meet HIV-related criteria for listing may not continue the evaluation process and, as an example, may not be evaluated by the surgeon. Because the length of evaluation can vary from one patient to the other, and because some patients died during the evaluation process, we used the MELD score at the time of referral for our analysis. The MELD score is a dynamic variable and can often change during the course of an evaluation. Therefore, the MELD score at initiation of the evaluation process may not reflect the MELD score used at the time of decision for listing.

Finally, this study was a single-center experience. Therefore, while this has the advantage of reflecting a homogenous practice, it may not be generalizable to other centers. Mount Sinai Medical Center is a tertiary care referral center for liver disease. This fact may, in part, explain the high number of patients with HCC referred and evaluated for LT, and indicate a potential bias towards rapid and comprehensive evaluation of these patients for LT. It is possible that patients who were declined for listing at our transplant center were referred and listed at other transplant centers. Within our region, only 2 of the 4 LT centers accept referrals for HIV-infected patients. We know of at least 1 patient who was listed and transplanted at another center, and it is reasonable to think that some patients may have been listed elsewhere.

In conclusion, with an increasing number of HIV-infected patients with advanced liver disease, evaluation for LT in these patients will be an important treatment option. Early identification of modifiable barriers, such as psychosocial problems, along with coordinated intervention with infectious disease specialists and hepatologists, will be an essential component to optimizing care for these patients. Better understanding and awareness of factors, such as the presence of HCC and HBV, could improve timely referrals that lead to improve listing rates in this patient population.

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Fig. 1.

Listing outcome for patients who were referred for an evaluation for liver transplantation (LT) from 2000–2012 stratified by human immunodeficiency virus (HIV) infection. *Cause of death: 10 infection (spontaneous bacterial peritonitis, sepsis, pneumonia, acute pyelonephritis, necrotizing fasciitis), 10 multi-organ failure, 3 esophageal variceal bleeding, 2 cardiac arrest, 1 metastatic hepatocellular carcinoma, 1 perforated gastric ulcer; 24 had unknown cause of death, as they occurred outside of our institution.

Fig. 2.

Long-term outcome of the 66 human immunodeficiency virus (HIV)-infected patients listed for liver transplantation. *Baseline liver disease of transplanted patients (a patient can have >1 condition): 50% hepatocellular carcinoma (HCC), 0% hepatitis B, 95% anti-hepatitis C virus (HCV) positive, 90% HCV RNA positive, 55% with history of alcohol, 5% with acute hepatitis. **Causes of death: Transplanted patients: recurrent, metastatic HCC (1 patient [pt]), spontaneous bacterial peritonitis (SBP) (1 pt), multi-organ failure (1 pt), SIRS/sepsis (2 pts), cardiac arrest (1 pt), cerebrovascular accident (1 pt), acute renal failure (1 pt), motor vehicle accident (1pt), and unknown (1 pt); median survival post-transplant 667.5 days (Q1–Q3: 220.25–937.75). Death on the list: HCC progression (2 pt), SBP (1 pt), variceal bleeding (2 pts), sepsis (2 pts), multi-organ failure (1 pt), cardiac arrest (1 pt), acute respiratory distress syndrome (1 pt), anoxic encephalopathy (1 pt), and unknown (5 pts); median survival after listing 142.5 days (Q1–Q3: 17.5–250.5). Q, quartile; SIRS, systemic inflammatory response syndrome.

Table 1

Baseline characteristics

	Listed (<i>n</i> = 66)	Not listed (<i>n</i> = 300)	<i>P</i> -value
Demographics			
Age, years, median (IQR)	52 (47–58)	51 (46–57)	0.35 ^a
Gender, male	51 (77.3%)	212 (70.7%)	0.28 ^b
Race, Caucasian	30 (45.5%)	115/286 (40.2%)	0.44 ^b
Education, College degree and more	26/62 (41.9%)	86/226 (38.1%)	0.58 ^b
Employment, working	14/65 (21.5%)	46/255 (18.0%)	0.52 ^b
HIV characteristics			
CD4+ T cells at referral, cells/ mm ³ , median (IQR)	387 (269–585)	333 (207–516)	0.09 ^a
HIV viral load undetectable at referral	51/59 (86.4%)	190/255 (74.5%)	0.05 ^b
Etiology of liver disease			
HCV antibodies	61 (92.4%)	263/294 (89.5%)	0.47 ^b
HCV RNA	47/54 (87.0%)	197/221 (89.1%)	0.66 ^b
Hepatitis B surface antigen	4/65 (6.2%)	45/286 (15.7%)	0.04 ^b
Alcohol	33/62 (53.2%)	144/267 (53.9%)	0.92 ^b
HCC	28/65 (43.1%)	48/280 (17.1%)	<0.0001 ^b
Acute hepatitis	3/63 (4.8%)	5/276 (1.8%)	0.17 ^c
Severity of liver disease			
MELD at referral, median (IQR)	14.3 (9.9–18.8)	12.7 (9.9–16.3)	0.21 ^a
Ascites	35 (53.0%)	112/275 (40.7%)	0.07 ^b
Encephalopathy	27/65 (41.5%)	88/274 (32.1%)	0.15 ^b
Spontaneous bacterial peritonitis	5 (7.6%)	10/272 (3.7%)	0.18 ^c
Portal hypertension bleeding	12 (18.2%)	54/277 (19.5%)	0.81 ^b
Malnutrition	18 (27.3%)	63/266 (23.7%)	0.54 ^b
Baseline medical history			

	Listed (<i>n</i> = 66)	Not listed (<i>n</i> = 300)	<i>P</i> -value
Cancer (other than HCC)	3/60 (5.0%)	16/262 (6.1%)	1.00 ^c
Heart disease	3/60 (5.0%)	21/257 (8.2%)	0.40 ^b
Psychiatric condition	12/61 (19.7%)	93/264 (35.2%)	0.02 ^b
History of drug abuse	43/63 (68.3%)	208/267 (77.9%)	0.11 ^b
Evaluation characteristics			
Referral by an ISMMS provider	25/65 (38.5%)	101/287 (35.2%)	0.62 ^b
Specialty of referring provider			0.001 ^b
Liver/gastroenterology	33/65 (50.8%)	156/282 (55.3%)	
Infectious diseases	15/65 (23.1%)	94/282 (33.3%)	
Oncology/surgical oncology	11/65 (16.9%)	11/282 (3.9%)	
Other	6/65 (9.2%)	21/282 (7.4%)	
Duration of evaluation, months, median (IQR)	7.2 (2.7–12.3)	9.8 (3.4–17.5)	0.06 ^a

Note: Denominators are presented to account for missing data.

^a Mann–Whitney U-test.

^b Chi-square test.

^c Fisher's exact test.

IQR, interquartile range; HIV, human immunodeficiency virus; HCV, hepatitis C virus; HCC, hepatocellular carcinoma; MELD, model for end-stage liver disease; ISSMS, Icahn School of Medicine at Mount Sinai;

Table 2

Multivariable analysis: Listed vs. not listed

	Univariable analysis			Multivariable analysis		
	OR	95% CI	P-value	OR	95% CI	P-value
MELD score	1.04	1.00–1.08	0.08	1.06	1.01–1.11	0.01
Baseline detectable HIV viral load	2.18	0.98–4.84	0.06	-	-	-
Hepatitis B surface antigen	0.35	0.12–1.01	0.05	0.26	0.08–0.79	0.02
Hepatocellular carcinoma	3.66	2.05–6.54	<0.001	5.79	2.97–11.28	<0.0001
Psychiatric condition	0.45	0.23–0.89	0.02	-	-	-
Duration in months	0.97	0.94–0.997	0.03	0.97	0.94–1.00	0.07
Ascites	1.64	0.96–2.82	0.07	-	-	-

OR, odds ratio ; CI, confidence interval; MELD, model for end-stage liver disease ; HIV, human immunodeficiency virus.