

Supplementary Online Content

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This supplementary material has been provided by the authors to give readers additional information about their work.

eTable 1. Inclusion and exclusion criteria defining veteran eligibility for listing for liver transplantation¹⁴

Clinical criteria	Definition/rationale
Inclusion criteria	
Decompensated cirrhosis—defined as having 1 inpatient ICD-9 code for hepatocellular carcinoma or a hepatic decompensation event, or 2 outpatient ICD-9 codes for these events ²¹	<ol style="list-style-type: none"> 1. Early stage hepatocellular carcinoma 2. Hepatic decompensation events such as ascites, spontaneous bacterial peritonitis, and/or variceal hemorrhage are indications for liver transplantation¹⁴
Exclusion criteria	
Age at diagnosis of decompensated cirrhosis or hepatocellular carcinoma ≥ 70	Only 4 patients waitlisted at VATC from 2003-2010 were aged ≥ 70 years at the time of waitlisting
Diagnosis of cancer (excluding prostate cancer, HCC, bladder cancer and non-melanoma skin cancer) within 5 years of diagnosis of decompensated cirrhosis	Contraindications to transplantation that could easily be identified in administrative data. ²⁰
Human immunodeficiency virus	Transplantation of patients with HIV limited during this time period, and nearly exclusively under NIH study protocol

eTable 2. Clinical data on patient and center-specific covariates for multivariable models

Variable	No. (%) or median (IQR)
Center-level*	
Median station age	57 (56-57)
Percentage of veterans identified as white race	54.0 (38.0-70.0)
Percentage of veterans below federal poverty level	25.3 (21.1-31.7)
Percentage of veterans with mental illness†	50.9 (47.2-54.5)
Patient-level‡	
Age at first hepatic decompensation event	57 (53-62)
Serum albumin at waitlisting	2.9 (2.5-3.4)
Laboratory MELD score at waitlisting	18 (13-25)
Age at waitlisting	57 (52-60)
Hepatocellular carcinoma	660 (22.8)
Insurance at listing for transplantation	
Veterans Health Administration	49.0
Private	692 (23.9)
Medicare	450 (15.5)
Medicaid	208 (7.2)
Other/missing	127 (4.4)

Abbreviations: IQR=inter-quartile range; MELD=Model for End-Stage Liver Disease

*Center-level covariates measured using data from the VA Clinical Case Registry: Hepatitis C

† Mental illness defined as: anxiety, bipolar disorder, depression, post-traumatic stress disorder, and/or schizophrenia

‡All reported patient-level covariates only for veterans who were waitlisted, derived from the Organ Procurement and Transplantation Network, with the exception of age at first hepatic decompensation event (ascites, variceal bleeding, hepatic encephalopathy, hepatocellular carcinoma, spontaneous bacterial peritonitis, or hepatorenal syndrome)

eTable 3. Comparison of using local VA center versus residential zip code of veterans waitlisted at the Pittsburgh VATC to compute travel distances, N=590*

Categorization of different measurements	Value
Difference in mileage when using distance from local VA center vs. home zip code, median (IQR)	18.7 (5.3-55.7)
Difference in categorization of distance from local VA center vs. home zip code, N (%)**	
Same distance category	492 (83.4)
Within 1 distance category	71 (12.0)
>1 distance category difference	27 (4.6)
Local VA center to VATC 0-100 miles	76
Local VA center to VATC 0-100 miles and home zip code to VATC>100 miles, N (% of total within 0-100 mile category)	8 (10.5)

* Distance from local center to the Pittsburgh VATC was computed directly from one VA center to the VATC, whereas travel distance from a veteran's home was based on travel distance from the centroid of the residential zip code of the veteran (available in UNOS data), using *geodist* and *geocode3* software available through Stata 13.

**Comparison of distance categories is based on the 0-100, 101-200, 201-300, 301-500, and >500 categorizations. For example, if local VA distance category was 101-200 and home zip code was 201-300, then defined as 1 distance category difference.

eTable 4. Association between distance from VA center to VA transplant center and waitlisting for transplantation among veterans with decompensated cirrhosis or HCC, N=50,637*

Variable	Listing at a VATC		Listing at any transplant center	
	Multivariable OR*	P-Value†	Multivariable OR*	P-Value†
Distance category‡				
0-100 miles (n=3,417)	1		1	
101-200 miles, (n=5,122)	0.47 (0.33-0.66)	<0.001	0.57 (0.42-0.78)	<0.001
201-300 miles (n=7,906)	0.32 (0.23-0.45)	<0.001	0.52 (0.39-0.69)	<0.001
301-500 miles (n=9,528)	0.44 (0.25-0.47)	<0.001	0.50 (0.38-0.67)	<0.001
>500 miles (n=24,664)	0.31 (0.23-0.41)	<0.001	0.47 (0.36-0.60)	<0.001
Age at first hepatic decompensation event**	0.96 (0.95-0.96)	<0.001	0.97 (0.96-0.97)	<0.001
Racial/ethnic composition of VA center††		0.14		0.43
76-100% white (n=3,461)	1		1	
51-75% white (n=22,026)	1.06 (0.78-1.45)		1.17 (0.91-1.50)	
26-50% white, (n=21,107)	0.84 (0.61-1.15)		1.05 (0.82-1.35)	
0-25% white (n=4,043)	0.95 (0.62-1.46)		0.99 (0.69-1.41)	
Median center age**	1.14 (1.01-1.29)	0.03	1.16 (1.06-1.28)	0.002

* Center-specific covariates of proportion of veterans with mental illness and percentage of veterans with a low socioeconomic status excluded from final model for listing at VATC as they were not significant in univariable or multivariable models ($P>0.5$) and were not confounders of the relationship between distance and listing.

† The p-value for the individual distance variables represents the pairwise comparison in the fully adjusted multivariable GEE models (column 1: outcome of listing at a VATC; column 2: outcome of listing at any transplant center), with 0-100 miles as the reference, whereas the p-value for racial/ethnic composition is the omnibus p-value for the overall category.

‡ Waitlisting rates by distance category: a) waitlisted at VATC: <100 miles: 7.1% (244/3,417); 101-200 miles: 2.8% (142/5,122); 201-300 miles: 2.3% (184/7,906); 301-500 miles: 2.6% (245/9,528); >500 miles: 2.4% (603/24,664); b) waitlisted at any transplant center: <100 miles: 10.9% (372/3,417); 101-200 miles: 5.5% (279/5,122); 201-300 miles: 5.4% (424/7,906); 301-500 miles: 5.8% (550/9,528); >500 miles: 5.2% (1,270/24,664); b) waitlisted at any transplant center

** Odds ratio for every increase in 1 year of age. The individual patient age at first hepatic decompensation event was considered a continuous variable.

†† The number within each racial/ethnic category represents the total number of transplant-eligible veterans receiving care at a VA center with that specific racial ethnic composition. Waitlisting rates by center-specific racial/ethnic composition: a) waitlisted at a VATC: 76-100% white: 2.6% (89/3,461); 51-75% white: 3.0% (670/22,026); 26-50% white: 2.6% (539/21,107); and ≤25% white: 3.0% (120/1,043); and b) waitlisted at any transplant center VATC: 76-100% white: 4.7% (163/3,461); 51-75% white: 5.9% (1,296/22,026); 26-50% white: 5.8% (1,213/21,107); and ≤25% white: 5.5% (223/1,043)

eTable 5. Comparison of adjusted and unadjusted waitlisting rates by distance category (n=50,637)*

Distance category	Unadjusted waitlisting rates, No. (%)		Marginal (adjusted) waitlisting rates, No. (%)	
	Waitlisting at VATC	Waitlisting at any transplant center	Waitlisting at VATC	Waitlisting at any transplant center
0-100 miles (n=3,417)	7.1%	10.9%	7.1% (5.5-8.7%)	10.2% (8.1-12.3%)
101-200 miles, (n=5,122)	2.8%	5.5%	3.5 (2.6-4.4%)	6.1% (4.8-7.4%)
201-300 miles (n=7,906)	2.3%	5.4%	2.4 (1.8-3.0%)	5.6% (4.6-6.6%)
301-500 miles (n=9,528)	2.6%	5.8%	2.5% (2.0-3.0%)	5.4% (4.6-6.3%)
>500 miles (n=24,664)	2.4%	5.2%	2.3% (2.0-2.7%)	5.1% (4.5-5.6%)

* Adjusted rates of waitlisting were calculated using the post-estimation *predict* commands in Stata that allowed for calculation of predicted adjusted rates of waitlisting based on the on the beta coefficients for the independent variables in the GEE model presented in Table 2 of the main text and eTable 4.

eTable 6. Differences in transplantation among waitlisted veterans as a function of distance to a VA transplant center or any (VA or non-VA) transplant center

	Distance in miles	Waitlisted at VATC, No.	Transplanted among veterans listed at a VATC, No. (%)	Waitlisted at any transplant center, No.	Transplanted among veterans listed at any transplant center, No. (%)
Distance from local VA center to VA transplant center	0-100	244	156 (63.9)	372	262 (70.4)
	101-200	142	76 (53.5)	279	164 (58.8)
	201-300	184	103 (56.0)	424	243 (57.3)
	301-500	245	125 (51.0)	550	294 (53.5)
	>500	604	326 (54.1)	1,270	700 (55.1)
	P-value*		0.045		<0.001

Abbreviations: VATC=VA transplant center

*The p-values were derived from chi-square tests for the proportion of veterans transplanted (yes/no) within each distance category