

Figure S1. Maintenance immunosuppression in patients 7-12 months post liver transplant compared with regimen 0-6 months posttransplant.

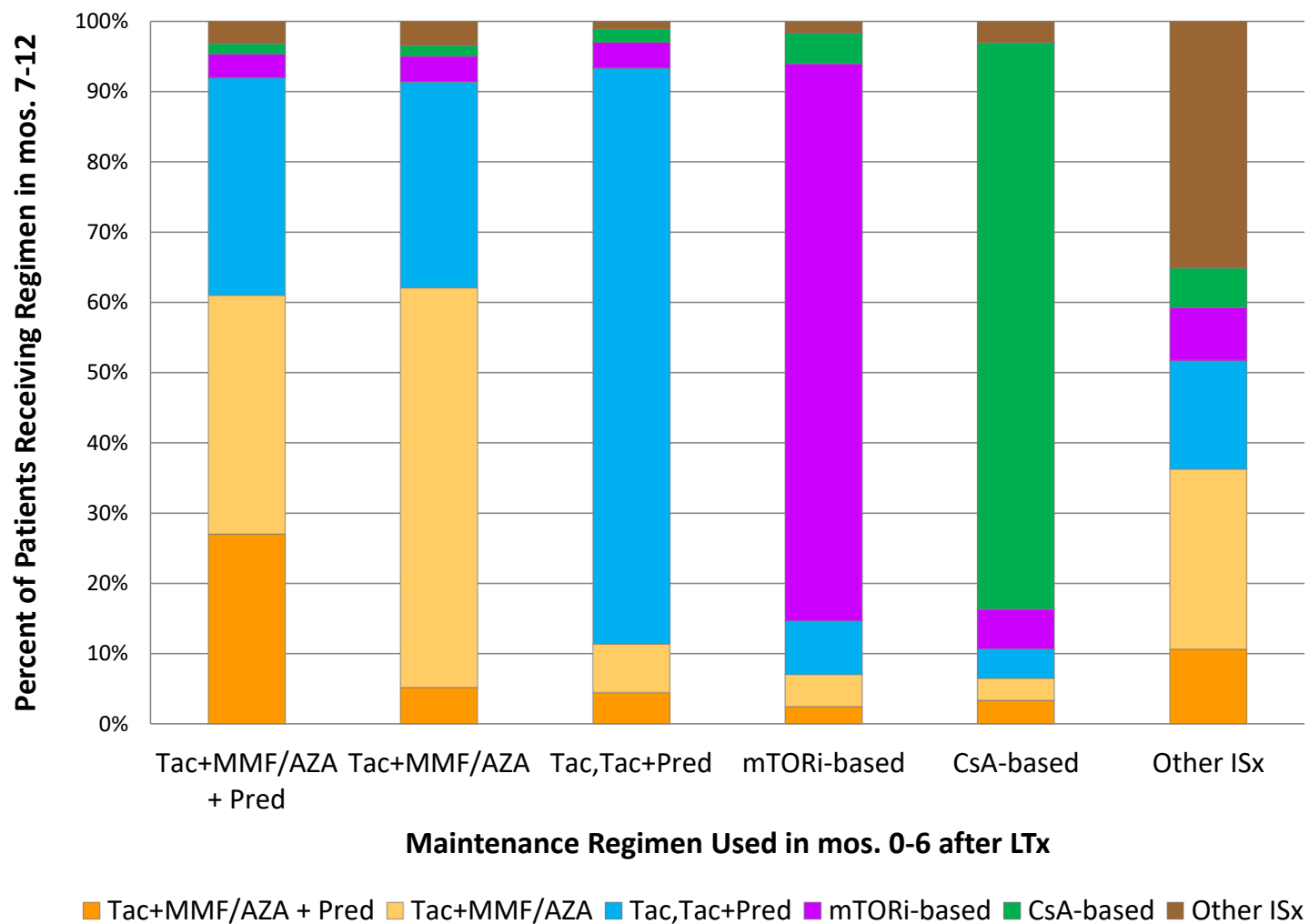


Figure S2. Proportion of patients receiving each maintenance immunosuppression option in months 7-12 after liver transplant across US centers (2006-2014). Each horizontal bar represents an individual center within US regions ordered by the proportion of patients receiving each regimen.

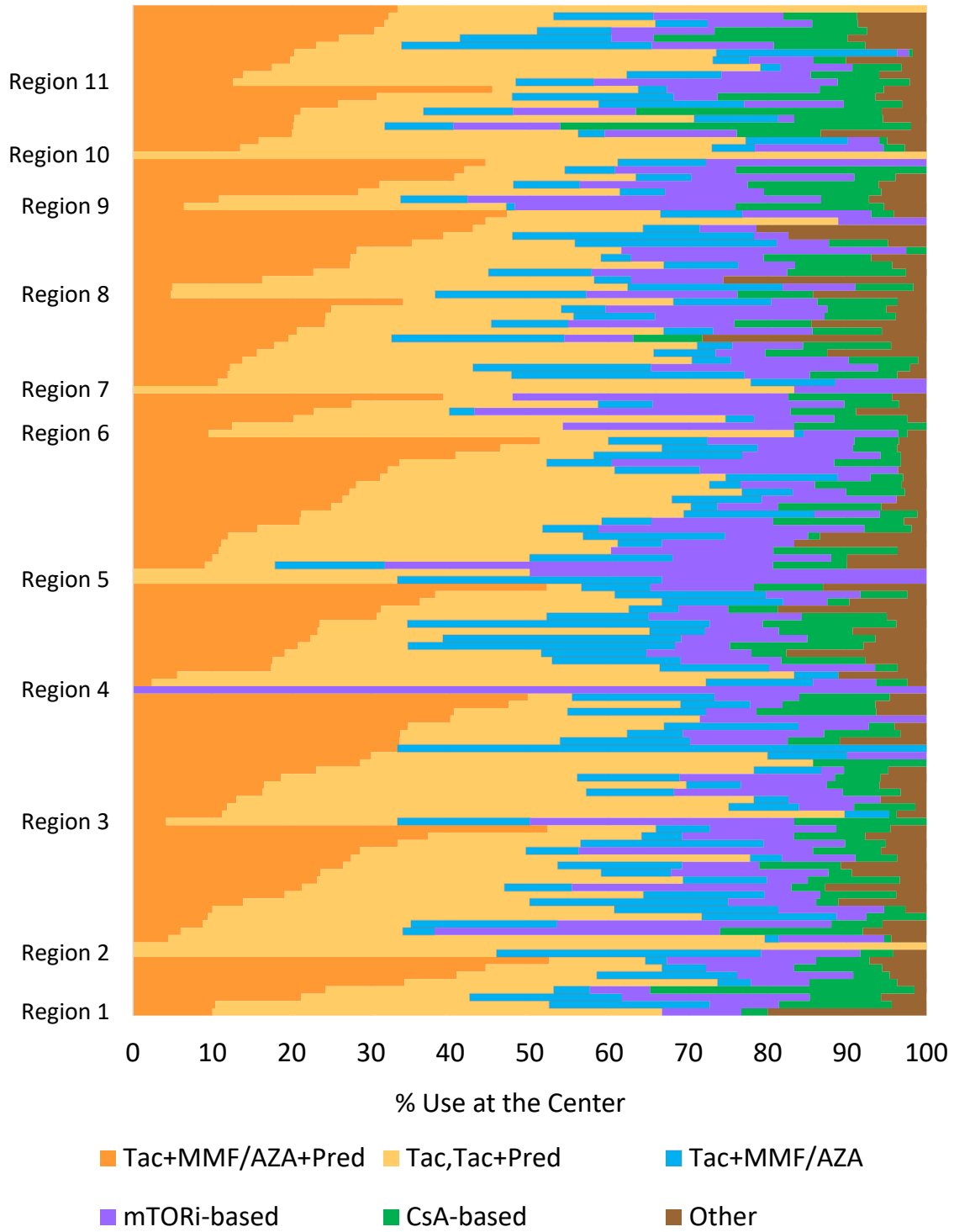


Figure S3. Empirical Bayes estimates for likelihood of use of each maintenance immunosuppression regimen compared with triple therapy in months 7-12 after liver transplant.

Adjusted Center-level Rates of Maintenance Regimen vs. Reference Regimen Empirical Bayes Estimates

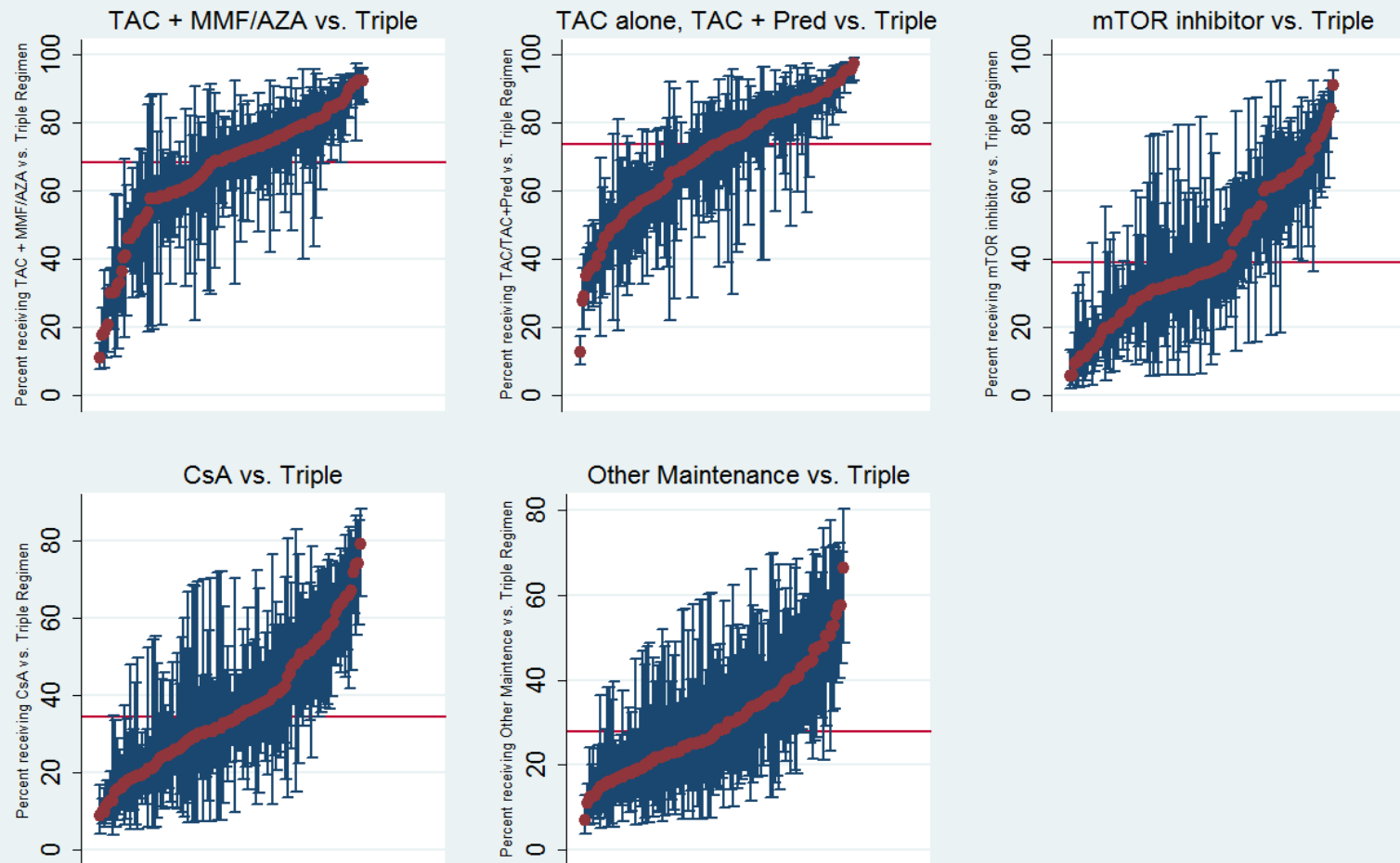


Table S1. Associations of recipient, donor, and transplant case characteristics with liver transplant maintenance immunosuppression regimen use in months 7-12 posttransplant compared with triple therapy (reference regimen)

	Tac + MMF/MPA	Tac alone, Tac + Pred	mTORi-based	CsA-based	Other ISx Maintenance
Induction regimen					
No induction	0.98 (0.82,1.16)	1.00 (0.84,1.18)	0.76 (0.61,0.94)*	0.99 (0.80,1.22)	0.93 (0.72,1.22)
Thymoglobulin	1.05 (0.75,1.48)	1.12 (0.81,1.54)	1.11 (0.75,1.65)	0.96 (0.64,1.44)	1.00 (0.61,1.62)
IL-2 receptor antibody	Reference	Reference	Reference	Reference	Reference
Alemtuzumab	0.91 (0.32,2.59)	2.96 (1.14,7.71)*	1.25 (0.39,4.07)	0.69 (0.17,2.71)	0.91 (0.24,3.48)
Other induction	0.95 (0.52,1.73)	1.07 (0.61,1.87)	1.64 (0.78,3.48)	1.07 (0.54,2.13)	1.21 (0.52,2.82)
Recipient characteristic					
Recipient age, years					
19 to 30	Reference	Reference	Reference	Reference	Reference
31 to 45	0.76 (0.59,0.99)*	0.89 (0.69,1.14)	0.66 (0.45,0.96)*	0.85 (0.58,1.26)	0.90 (0.60,1.36)
46 to 60	1.26 (1.07,1.48)*	1.41 (1.20,1.66)‡	1.52 (1.22,1.89)‡	1.49 (1.19,1.87)†	1.28 (0.98,1.67)
>60	1.40 (1.15,1.70)†	1.72 (1.42,2.07)‡	2.10 (1.64,2.69)‡	1.49 (1.19,1.87)†	1.72 (1.27,2.33)‡
Male recipient	0.98 (0.87,1.09)	0.87 (0.78,0.97)*	0.93 (0.81,1.07)	0.93 (0.80,1.07)	1.02 (0.86,1.21)
Recipient race					
White	Reference	Reference	Reference	Reference	Reference
Black	0.69 (0.58,0.83)‡	0.66 (0.55,0.79)‡	0.69 (0.55,0.88)†	0.62 (0.49,0.80)‡	1.06 (0.81,1.38)

	Tac + MMF/MPA	Tac alone, Tac + Pred	mTORi-based	CsA-based	Other ISx Maintenance
Hispanic	0.79 (0.67,0.94)*	0.72 (0.61,0.85)‡	0.61 (0.49,0.76)‡	0.78 (0.63,0.97)*	0.79 (0.60,1.03)
Other	1.22 (0.96,1.56)	0.82 (0.65,1.05)	0.94 (0.69,1.28)	0.78 (0.56,1.10)	0.85 (0.56,1.28)
Body mass index, kg/m²					
<18.5	0.83 (0.57,1.22)	1.22 (0.86,1.74)	0.98 (0.60,1.59)	1.29 (0.80,2.09)	1.24 (0.70,2.19)
18.5 to 24.9	Reference	Reference	Reference	Reference	Reference
25 to 30	1.19 (1.04,1.36)*	1.23 (1.08,1.40)†	1.30 (1.10,1.54)*	1.14 (0.96,1.35)	1.29 (1.04,1.59)*
>30	1.16 (1.01,1.33)*	1.15 (1.01,1.32)*	1.15 (0.97,1.38)	1.02 (0.85,1.22)	1.19 (0.96,1.48)
Unknown	1.32 (0.86,2.01)	0.91 (0.60,1.38)	1.29 (0.78,2.13)	0.86 (0.47,1.58)	0.95 (0.50,1.79)
Cause of ESLD					
HCC	1.33 (1.07,1.65)*	1.51 (1.22,1.86)‡	2.15 (1.64,2.80)‡	1.49 (1.13,1.96)*	1.03 (0.74,1.43)
HCV	1.23 (1.02,1.49)*	1.67 (1.39,2.01)‡	1.36 (1.07,1.74)*	2.16 (1.70,2.74)‡	1.07 (0.80,1.43)
HBV	1.07 (0.71,1.61)	1.48 (0.99,2.21)	1.33 (0.80,2.22)	1.49 (0.88,2.52)	0.92 (0.48,1.77)
Metabolic	0.87 (0.60,1.26)	1.00 (0.70,1.44)	1.21 (0.76,1.93)	1.04 (0.63,1.70)	0.85 (0.47,1.52)
Alcoholic	Reference	Reference	Reference	Reference	Reference
NASH	0.94 (0.73,1.20)	0.94 (0.73,1.21)	1.06 (0.78,1.45)	1.02 (0.74,1.41)	0.85 (0.58,1.25)
Other	0.55 (0.46,0.66)‡	0.62 (0.52,0.74)‡	0.71 (0.57,0.90)*	0.58 (0.46,0.74)‡	0.63 (0.48,0.83)†
Recipient comorbidity					
Diabetes	1.20 (0.50,2.88)	0.72 (0.30,1.73)	1.28 (0.43,3.79)	0.80 (0.26,2.46)	0.93 (0.23,3.67)

	Tac + MMF/MPA	Tac alone, Tac + Pred	mTORi-based	CsA-based	Other ISx Maintenance
Coronary artery disease/Angina	0.91 (0.61,1.37)	0.97 (0.66,1.44)	0.77 (0.47,1.24)	0.72 (0.43,1.22)	1.26 (0.73,2.18)
COPD	0.95 (0.64,1.40)	0.70 (0.48,1.04)	0.72 (0.43,1.21)	0.83 (0.50,1.37)	0.67 (0.34,1.33)
Hypertension	0.96 (0.83,1.10)	0.87 (0.75,1.00)*	0.94 (0.79,1.12)	0.90 (0.75,1.09)	0.84 (0.67,1.05)
Cerebral vascular disease	0.84 (0.42,1.69)	1.05 (0.55,2.01)	1.30 (0.57,2.95)	0.97 (0.42,2.23)	1.21 (0.47,3.11)
Peripheral vascular disease	1.26 (0.69,2.29)	0.85 (0.46,1.56)	0.41 (0.18,0.95)*	0.84 (0.39,1.77)	1.09 (0.45,2.64)
Lab MELD score					
0 to 9	Reference	Reference	Reference	Reference	Reference
10 to 14	1.03 (0.89,1.19)	1.24 (1.07,1.43)*	1.14 (0.94,1.37)	0.96 (0.79,1.15)	1.06 (0.85,1.33)
15 to 19	1.06 (0.88,1.27)	1.13 (0.95,1.35)	1.20 (0.95,1.52)	0.98 (0.77,1.24)	0.82 (0.61,1.10)
20 to 24	1.17 (0.94,1.45)	1.06 (0.85,1.30)	1.29 (0.98,1.69)	0.97 (0.73,1.28)	0.96 (0.69,1.35)
25 to 29	0.93 (0.74,1.18)	1.00 (0.79,1.25)	1.09 (0.81,1.46)	0.80 (0.59,1.09)	0.98 (0.68,1.41)
30 to 34	0.85 (0.65,1.11)	0.93 (0.72,1.20)	0.93 (0.65,1.31)	0.92 (0.65,1.29)	1.26 (0.87,1.84)
35 to 39	0.99 (0.75,1.31)	0.96 (0.72,1.27)	1.29 (0.91,1.84)	0.97 (0.67,1.40)	0.92 (0.58,1.44)
Primary insurance source					
Private	1.26 (1.12,1.41)‡	1.12 (1.00,1.25)	1.11 (0.96,1.28)	1.05 (0.91,1.22)	1.10 (0.92,1.32)
Public	Reference	Reference	Reference	Reference	Reference
Self/Other	0.87 (0.40,1.88)	1.71 (0.90,3.25)	1.15 (0.52,2.52)	0.54 (0.18,1.68)	1.45 (0.55,3.79)

	Tac + MMF/MPA	Tac alone, Tac + Pred	mTORi-based	CsA-based	Other ISx Maintenance
Donor and transplant factors					
Donor risk index	Reference	Reference	Reference	Reference	Reference
0 to <1.5	0.95 (0.84,1.09)	0.93 (0.82,1.05)	0.91 (0.78,1.08)	1.00 (0.85,1.19)	1.13 (0.93,1.39)
1.5 to <2.0	0.87 (0.74,1.02)	0.99 (0.84,1.15)	0.90 (0.74,1.10)	1.01 (0.82,1.24)	1.01 (0.79,1.30)
2.0 to <2.5	0.98 (0.79,1.22)	0.87 (0.71,1.08)	0.77 (0.58,1.02)	0.86 (0.65,1.14)	0.92 (0.65,1.31)
>=2.5	0.85 (0.63,1.14)	0.94 (0.71,1.25)	0.61 (0.40,0.93)*	0.60 (0.40,0.90)*	1.49 (0.97,2.28)
LVD	Reference	Reference	Reference	Reference	Reference
Previous transplant	0.57 (0.47,0.70)‡	0.78 (0.65,0.93)*	0.69 (0.53,0.88)*	0.92 (0.72,1.18)	0.84 (0.62,1.13)
eGFR at discharge					
>=90	Reference	Reference	Reference	Reference	Reference
60 to 89	0.99 (0.85,1.15)	0.98 (0.85,1.14)	0.78 (0.64,0.95)*	1.11 (0.90,1.36)	1.09 (0.86,1.38)
30 to 59	0.84 (0.71,0.99)*	0.81 (0.69,0.95)*	1.13 (0.93,1.38)	1.24 (1.00,1.53)	0.97 (0.75,1.25)
0 to 29	0.67 (0.50,0.89)*	0.72 (0.54,0.95)*	1.98 (1.44,2.72)‡	1.50 (1.07,2.10)*	0.88 (0.57,1.36)
Missing	0.83 (0.56,1.23)	0.90 (0.63,1.31)	0.93 (0.57,1.52)	1.28 (0.78,2.10)	1.22 (0.67,2.20)
Function status at 6 months after transplant					
Severe impairment	0.62 (0.39,0.99)*	1.18 (0.77,1.80)	1.03 (0.62,1.70)	1.96 (1.25,3.09)*	0.96 (0.50,1.82)
Moderate impairment	0.68 (0.53,0.86)	1.07 (0.85,1.35)	1.20 (0.91,1.58)	1.33 (1.01,1.74)*	1.03 (0.73,1.46)

	Tac + MMF/MPA	Tac alone, Tac + Pred	mTORi-based	CsA-based	Other ISx Maintenance
Mild impairment	Reference	Reference	Reference	Reference	Reference
Unknown	0.94 (0.77,1.16)	0.98 (0.80,1.20)	0.88 (0.67,1.15)	0.95 (0.72,1.24)	0.91 (0.66,1.27)
Baseline malignancy	1.04 (0.90,1.21)	0.99 (0.86,1.15)	1.18 (0.99,1.42)	0.91 (0.75,1.10)	1.03 (0.81,1.30)
Malignancy incident through 6 months	0.83 (0.42,1.63)	1.59 (0.88,2.88)	6.07 (3.26,11.27)‡	1.69 (0.80,3.56)	1.83 (0.75,4.43)
Acute reject at 6 months	0.32 (0.26,0.38)‡	0.33 (0.27,0.39)‡	0.72 (0.58,0.89)*	0.49 (0.39,0.62)‡	0.64 (0.48,0.84)†
Transplant year					
2006 to 2009	Reference	Reference	Reference	Reference	Reference
2010 to 2012	1.01 (0.86,1.20)	0.84 (0.72,0.99)*	0.80 (0.66,0.98)*	1.00 (0.81,1.23)	0.86 (0.68,1.09)
2013 to 2014	1.01 (0.85,1.20)	0.75 (0.63,0.88)†	0.88 (0.71,1.09)	0.68 (0.54,0.85)†	0.52 (0.40,0.68)‡

P-values: * $0.02 \leq p < 0.05$; † $0.0001 \leq p < 0.01$; ‡ $p < 0.0001$

Abbreviations: AZA, azathioprine; BMI, body mass index; CsA, cyclosporine; eGFR, estimated glomerular filtration rate; HCC, hepatocellular carcinoma; HCV, hepatitis C virus; HBV, hepatitis B virus; COPD, chronic obstructive pulmonary disease, LVD, living donor; mTOR: mammalian target of rapamycin inhibitor; MMF/MPA, mycophenolate acid; NASH, non-alcoholic steatohepatitis; Pred, prednisone SRL, Sirolimus; Tac, Tacrolimus.