

Supplementary Appendix 1. International Classification of Disease, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis codes used to define medical diagnoses from billing claims data.

Diagnosis	ICD-9-CM Diagnostic Codes
Ventricular arrhythmias	427.41, 427.42
Cardiac arrest	427.5, 997.1
Hypotension	458, 458.9
Hypercapnia	276.4
Aspiration pneumonia	507.0, 507.1, 507.8, 997.32
Mental status changes	780.0, 780.01, 780.02, 780.03, 780.09, 800.x, 801.x, 803.x, 804.x, 850.x
Accidents	E806, E807, E826, E827, E829, E830, E831, E836, E838, E841, E842, E844, E845, E916, E918, E921, E928, E928.x, E929, E929.x, V714
Drug abuse / dependence	304.2, 304.0, 304.7, 304.3, 304.1, 304.4, 304.5, 304.6, 304.8, 304.9, 305.6, 305.5, 305.2, 305.3, 305.4, 305.7, 305.8, 305.9, 292.x
Alcohol abuse and associated complications	303.0, 303.9, 305.0, 291.x, 571.0, 571.2, 571.3, 535.3
Non-compliance	V158.1

Supplementary Appendix 2. Adjusted associations of pre-transplant narcotic use with risks of the composite of any study complication over three years after kidney transplantation.

Clinical factor	All Transplants	LD Recipients	DD Recipients
	aHR (95% CI)	aHR (95% CI)	aHR (95% CI)
Pre-transplant narcotic use			
None	Reference	Reference	Reference
Level 1	0.97 (0.81-1.15)	1.00(0.71-1.41)	0.96 (0.79-1.17)
Level 2	1.07 (0.91-1.26)	1.18 (0.87-1.60)	1.03 (0.85-1.25)
Level 3	1.26 (1.09-1.46)*	1.25 (0.93-1.68)	1.26 (1.07-1.49)*
Level 4	1.62 (1.42-1.85)‡	1.83 (1.40-2.38)‡	1.56 (1.33-1.82)‡
Recipient characteristics			
Age, years			
<18	0.84 (0.53-1.34)	0.59 (0.24-1.48)	0.97 (0.56-1.69)
18 to 30	Reference	Reference	Reference
31 to 45	0.91 (0.75-1.11)	0.87 (0.64-1.19)	0.98 (0.76-1.26)
46 to 60	1.05 (0.87-1.27)	0.94 (0.69-1.28)	1.14 (0.89-1.46)
>60	1.03 (0.82-1.30)	0.91 (0.61-1.35)	1.12 (0.83-1.50)
Male	1.00 (0.91-1.10)	0.95 (0.79-1.14)	1.03 (0.92-1.15)
Race			
White	Reference	Reference	Reference
Black	0.80 (0.71-0.91)‡	0.63 (0.35-1.12)	0.78 (0.68-0.90)‡
Other race	0.68 (0.57-0.79)‡	0.92 (0.59-1.42)	0.66 (0.55-0.79)‡
Body mass index, kg/m ²			
<18.5	1.16 (0.92-1.47)	1.18 (0.75-1.84)	1.16 (0.88-1.53)
18.5 to 25	Reference	Reference	Reference
25 to 30	0.99 (0.89-1.10)	1.00 (0.81-1.25)	0.99 (0.88-1.12)
>30	0.97 (0.86-1.09)	1.08 (0.86-1.36)	0.94 (0.82-1.08)
Highest level of education			
Grade school	Reference	Reference	Reference
High school	1.14 (0.93-1.39)	0.98 (0.60-1.58)	1.19 (0.96-1.48)
Some college or higher	1.00 (0.82-1.22)	1.06 (0.65-1.72)	0.97 (0.78-1.22)
Unknown	1.01 (0.81-1.24)	1.00 (0.60-1.66)	0.99 (0.79-1.26)
Employment status			
Working	0.71 (0.60-0.84)‡	0.79 (0.58-1.07)	0.68 (0.56-0.84)‡
Not working	Reference	Reference	Reference
Unknown	0.86 (0.75-0.98)*	0.91 (0.69-1.21)	0.84 (0.72-0.98)*
Insurance type			
Public	Reference	Reference	Reference
Private	0.51 (0.43-0.59)‡	0.47 (0.35-0.62)‡	0.54 (0.45-0.66)‡
Other/unknown	0.91 (0.33-2.52)	NA	1.13 (0.40-3.19)
Pre-transplant ESRD duration, months			
None (pre-emptive)	0.76 (0.61-0.95)*	0.82 (0.57-1.20)	0.79 (0.59-1.06)
>0 to 24	Reference	Reference	Reference
25 to 60	0.98 (0.85-1.14)	1.07 (0.82-1.41)	0.96 (0.81-1.14)
>60	1.4 (1.23-1.59)	1.61 (1.19-2.18)‡	1.39 (1.20-1.61)‡

Supplementary Appendix 2, continued. Adjusted associations of pre-transplant narcotic use with risks of the composite of any study complication over three years after kidney transplantation.

Cause of ESRD			
Diabetes	1.16 (0.97-1.38)	1.11 (0.78-1.59)	1.17 (0.95-1.44)
Glomerulonephritis	0.89 (0.77-1.03)	0.75 (0.57-0.99)*	0.94 (0.79-1.12)
Hypertension	1.02 (0.89-1.17)	0.98 (0.75-1.28)	1.05 (0.90-1.22)
Polycystic kidney disease	0.91 (0.75-1.11)	0.88 (0.59-1.30)	0.93 (0.74-1.16)
Other	Reference	Reference	Reference
Recipient co-morbidities			
Diabetes	1.21 (1.05-1.39)*	1.06 (0.79-1.42)	1.26 (1.08-1.48)*
Coronary disease/angina	1.07 (0.89-1.29)	0.96 (0.63-1.46)	1.11 (0.91-1.37)
COPD	1.32 (0.96-1.82)	1.35 (0.72-2.52)	1.32 (0.91-1.93)
Hypertension	0.88 (0.80-0.96)*	0.88 (0.73-1.05)	0.88 (0.79-0.97)*
Cerebral vascular disease	1.26 (1.01-1.58)*	1.17 (0.70-1.97)	1.26 (0.98-1.62)
Peripheral vascular disease	1.08 (0.90-1.29)	1.06 (0.73-1.53)	1.08 (0.88-1.33)
Previous transplant	1.1 (0.95-1.26)	1.03 (0.78-1.36)	1.12 (0.95-1.32)
Peak PRA level			
< 10	Reference	Reference	Reference
10 to 79	1.00 (0.89-1.13)	0.94 (0.74-1.20)	1.02 (0.89-1.17)
≥80	1.26 (1.08-1.46)*	1.24 (0.87-1.77)	1.28 (1.08-1.51)*
Missing	1.27 (1.04-1.56)*	1.08 (0.74-1.57)	1.38 (1.09-1.75)*
Transplant Characteristics			
HLA mismatches			
Zero A, B, and DR	0.93 (0.80-1.07)	1.08 (0.78-1.49)	0.88 (0.75-1.04)
Zero DR	0.95 (0.87-1.04)	1.07 (0.90-1.28)	0.92 (0.83-1.02)
Other	Reference	Reference	Reference
Donor age, per year	1.00 (1.00-1.01)*	1.00 (1.00-1.01)	1.00 (1.00-1.01)*
Donor race			
White	Reference	Reference	Reference
Black	1.07 (0.94-1.23)	1.53 (0.85-2.75)	1.02 (0.88-1.18)
Other race	1.01 (0.89-1.14)	0.69 (0.45-1.05)	1.04 (0.91-1.19)
Female donor	1.05 (0.96-1.14)	1.03 (0.87-1.23)	1.06 (0.95-1.17)
CMV sero-pairing			
Recipient -, Donor -	Reference	Reference	Reference
Recipient +, Donor -	1.03 (0.89-1.20)	0.99 (0.76-1.29)	1.06 (0.88-1.28)
Recipient -, Donor +	1.18 (1.01-1.37)*	1.11 (0.83-1.47)	1.22 (1.02-1.47)*
Recipient +, Donor+	1.15 (1.00-1.33)*	1.07 (0.83-1.38)	1.20 (1.01-1.43)*
Donor Type			
Living	0.87 (0.78-0.98)*	NA	NA
Standard criteria deceased	Reference	Reference	Reference
Expanded criteria deceased	0.95 (0.82-1.10)	NA	NA

Abbreviations: aHR, adjusted hazard ratio; CMV, cytomegalovirus; COPD, chronic obstructive pulmonary disease; DD, deceased donor; ESRD, end-stage renal disease; HLA, human leukocyte antigen; LD, living donor; NA, not available due to lack of events in a given stratum; PRA, panel reactive antibody

P-values: * p<0.05–0.002; † p=0.001–0.0002; ‡ p<0.0001