

### **Suggested Electronic Appendix**

**Table S1.** Distribution of stabilized weights in a marginal structural model

<b>Percentile</b>	<b>Stabilized weights</b>
0 (minimum)	0.0049
First	0.24
5 <sup>th</sup>	0.44
10 <sup>th</sup>	0.57
25 <sup>th</sup>	0.77
50 <sup>th</sup> (median)	0.95
75 <sup>th</sup>	1.11
90 <sup>th</sup>	1.43
95 <sup>th</sup>	1.77
99 <sup>th</sup>	3.11
100 (maximum)	308
mean	1.02

**Table S2.** Hazard ratios (95% confidence intervals) for the association between spKt/V categories (Reference: 1.2-<1.4) and all-cause mortality using a marginal structural model analysis with censoring weights for kidney transplantation and censoring weights for loss to follow-up

spKt/V Range	Hazard ratio	95% Confidence interval	P-value
<1.2	1.67	1.54-1.80	<0.001
1.2-<1.4	Reference	Reference	Reference
1.4-<1.6	0.74	0.70-0.78	<0.001
1.6-<1.8	0.63	0.59-0.66	<0.001
1.8-<2.0	0.56	0.52-0.60	<0.001
≥2.0	0.56	0.52-0.61	<0.001

*Note:* The stabilized weight was calculated as the product of inverse-probability-of-treatment-weight, inverse-probability-of-transplant-weight, and inverse-probability-of-censoring-weight due to lost follow-up. MSM analysis included 68,110 patients. The percentages of patients censored due to transplantation, and loss to follow-up were 4%, and 2%, respectively.

**Table S3.** Hazard ratios (95% confidence intervals) for the association between spKt/V categories (Reference: 1.2-<1.4) and all-cause mortality using a marginal structural model without imputation for missing covariates

spKt/V Range	HR	95%CI	P value
<1.2	1.75	1.45-2.12	<0.001
1.2-<1.4	Reference	Reference	Reference
1.4-<1.6	0.76	0.68-0.85	<0.001
1.6-<1.8	0.67	0.60-0.76	<0.001
1.8-<2.0	0.57	0.49-0.66	<0.001
≥2.0	0.61	0.51-0.73	<0.001

*Note:* The marginal structural model analysis without imputation included 30,813 patients.

*Abbreviations:* HR, Hazard ratio; CI, confidence interval.

**Table S4.** Hazard ratios (95% confidence intervals) of all-cause mortality comparing spKt/V (Reference: 1.2-<1.4) using a marginal structural model in different subgroups

Subgroups	All-cause mortality hazard ratios (95% confidence intervals)					
	spKt/V<1.2	spKt/V 1.2-<1.4	spKt/V 1.4-<1.6	spKt/V 1.6-<1.8	spKt/V 1.8-<2.0	spKt/V≥2.0
Female patients	1.70 (1.49-1.95)	Reference	0.69 (0.64-0.75)	0.56 (0.51-0.61)	0.52 (0.47-0.57)	0.52 (0.46-0.58)
Male patients	1.67 (1.52-1.84)	Reference	0.75 (0.71-0.81)	0.68 (0.63-0.73)	0.59 (0.54-0.65)	0.62 (0.55-0.71)
Non-Hispanic Caucasian patients	1.72 (1.54-1.93)	Reference	0.70 (0.65-0.76)	0.62 (0.57-0.67)	0.53 (0.48-0.58)	0.56 (0.50-0.62)
African-American patients	1.58 (1.39-1.78)	Reference	0.78 (0.72-0.85)	0.65 (0.59-0.72)	0.60 (0.53-0.68)	0.63 (0.55-0.74)
Hispanic patients	1.54 (1.22-1.95)	Reference	0.74 (0.64-0.86)	0.60 (0.51-0.69)	0.56 (0.47-0.67)	0.48 (0.39-0.59)
Age<65 years	1.62 (1.46-1.80)	Reference	0.77 (0.72-0.83)	0.67 (0.61-0.72)	0.55 (0.50-0.62)	0.58 (0.51-0.66)
Age≥65 years	1.73 (1.54-1.95)	Reference	0.71 (0.66-0.77)	0.60 (0.56-0.65)	0.56 (0.51-0.61)	0.53 (0.48-0.59)
Diabetic patients	1.64 (1.49-1.81)	Reference	0.72 (0.67-0.77)	0.62 (0.58-0.67)	0.54 (0.49-0.59)	0.55 (0.49-0.61)
Non-diabetic patients	1.71 (1.50-1.95)	Reference	0.77 (0.71-0.84)	0.64 (0.58-0.70)	0.59 (0.53-0.66)	0.60 (0.53-0.68)
Albumin<3.8 g/dL	1.66 (1.51-1.82)	Reference	0.71 (0.66-0.76)	0.58 (0.54-0.62)	0.52 (0.47-0.56)	0.50 (0.45-0.56)
Albumin≥3.8 g/dL	1.95 (1.72-2.21)	Reference	0.70 (0.64-0.76)	0.59 (0.54-0.65)	0.50 (0.45-0.56)	0.51 (0.44-0.58)
Dialysis duration<1	1.64 (1.47-1.82)	Reference	0.74 (0.69-0.80)	0.62 (0.57-0.67)	0.56 (0.51-0.61)	0.59 (0.53-0.66)

yr						
Dialysis duration≥1 yr	1.74 (1.55-1.95)	Reference	0.73 (0.67-0.78)	0.63 (0.59-0.69)	0.55 (0.50-0.61)	0.53 (0.47-0.60)
Low BMI	1.45 (0.97-2.18)	Reference	0.67 (0.53-0.84)	0.63 (0.50-0.80)	0.55 (0.43-0.72)	0.59 (0.44-0.78)
Medium BMI	1.66 (1.52-1.83)	Reference	0.74 (0.70-0.78)	0.64 (0.60-0.69)	0.59 (0.54-0.64)	0.60 (0.55-0.66)
High BMI	1.67 (1.44-1.94)	Reference	0.80 (0.72-0.90)	0.72 (0.64-0.82)	0.64 (0.54-0.76)	0.59 (0.46-0.74)

*Note:* Low, medium, and high BMI subgroups include patients with body mass index<18.5, 18.5-<30, and ≥30 kg/m<sup>2</sup>, respectively.

*Abbreviations:* BMI, body mass index.

**Table S5.** All-cause mortality hazard ratios (95% confidence intervals) associated with each incremental elevation of 0.2 units in spKt/V values using joint modeling analyses in 68,060 hemodialysis patients

Model	HR	95% CI	P value
Case-mix	0.92	0.91-0.92	<0.001
Case-mix and MICS	0.95	0.94-0.95	<0.001

*Note:* Case-mix model was adjusted for age, sex, race/ethnicity, dialysis duration categories, primary insurance, presence of diabetes, 9 preexisting comorbidities, history of tobacco smoking, types of vascular access, and time-varying body mass index. Case-mix and MICS model was adjusted for all of the case-mix covariates plus time-varying serum levels of albumin, TIBC, ferritin, creatinine, phosphorus, calcium, bicarbonate, hemoglobin, blood WBC count, and lymphocyte percentage.

*Abbreviations:* HR, hazard ratio; CI, confidence interval; MICS, malnutrition inflammation complex syndrome.

**Table S6.** Death rates in 68,110 maintenance hemodialysis patients according to average spKt/V categories

Average spKt/V Range	All	<1.2	1.2-<1.4	1.4-<1.6	1.6-<1.8	1.8-<2.0	≥2.0	P for trend
Number of patients (%)	68,110 (100)	2,811 (4)	10,972 (16)	24,437 (36)	19,199 (28)	7,604 (11)	3,087 (5)	NA
Death (n) [crude death rate %]	23,810 [35]	1,248 [44]	4,292 [39]	8,517 [35]	6,376 [33]	2,427 [32]	950 [31]	<0.001
Crude all-cause mortality rate (/1,000 person-years) [95%CI]	159 [157,161]	280 [265,296]	208 [202,214]	153 [150,157]	141 [138,145]	141 [136,147]	145 [136,154]	NA

### Figure legends

**Figure S1.** Algorithm of the study cohort creation

