

SUPPLEMENTAL MATERIAL

SUPPLEMENTAL TABLES

Table S1: Patient characteristics of subjects included compared to those excluded, stratified by dialysis modality

	PD			HD			Missing
	Included	Excluded	<i>P</i>	Included	Excluded	<i>P</i>	Excluded
	<i>n</i> = 10,006	<i>n</i> = 462		<i>n</i> = 119,010	<i>n</i> = 21,939		<i>n</i> = 13,312
Age (yr)	56 ± 15	34 ± 26	<0.001	62 ± 16	61 ± 16	<0.001	62 ± 16
Sex (% female)	47	50	0.22	45	43	<0.001	44
Diabetes mellitus (%)	49	28	<0.001	58	52	<0.001	53
Race/ethnicity (%)							
Asian	5	4	0.11	3	3	0.15	3
Black	21	16	0.009	33	29	<0.001	23
Hispanic	13	25	<0.001	15	8	<0.001	13
White	54	50	0.08	43	52	<0.001	56
Other	6	5	0.66	7	7	0.10	6
Vintage (time on dialysis,%):							
0-6 months	62	62	0.95	57	30	<0.001	4
6-24 months	18	14	0.07	17	29	<0.001	0
2-5 years	14	11	0.04	16	24	<0.001	0
>5 years	7	4	0.007	10	14	<0.001	0
Marital status (%)							
Married	61	29	<0.001	47	55	<0.001	.
Single	23	60	<0.001	28	26	<0.001	.
Widowed	8	6	0.31	16	13	<0.001	.
Divorced	8	4	0.004	8	7	<0.001	.
Comorbid conditions (%)							
Atherosclerotic heart disease	16	10	0.0002	21	23	<0.001	24
Congestive heart failure	18	14	0.04	28	26	<0.001	33
Other cardiac diseases	4	5	0.52	6	6	0.04	10
Cerebrovascular disease	5	5	0.96	8	7	0.0009	9
Peripheral vascular disease	8	6	0.07	12	11	0.005	14
Chronic obstructive pulmonary disease	4	2	0.08	6	6	0.24	8
Cancer	4	3	0.31	4	6	<0.001	7
Current smoker	5	3	0.01	5	4	<0.001	5

Data are presented as mean ± SD, median (interquartile range), or percentage.

Table S2A: Baseline characteristics by category of serum albumin-corrected calcium in patients undergoing PD.

	Albumin-corrected serum calcium category mg/dl (n)					
	Total (n =10,066)	< 8.5 (332)	8.5 < to 8.9 (917)	9.0 < to 9.4 (2,810)	9.5 < to 10.1 (4,610)	≥10.2 (1,397)
Age (yr)	56 ± 15	48 ± 15	53 ± 16	56 ± 16	56 ± 15	57 ± 15
Sex (% female)	47	38	35	40	50	59
Diabetes mellitus (%)	49	44	47	51	49	42
Body mass index (kg/m ²)	26.6 ± 3.9	26.8 ± 3.7	26.6 ± 3.7	26.6 ± 4.2	26.6 ± 4.0	26.4 ± 3.1
Race/ethnicity (%)						
White	54	41	45	54	56	56
Black*	21	33	23	18	21	56
Hispanic	13	16	17	15	13	9
Asian	5	3	7	5	4	4
Other	6	7	8	5	5	5
Vintage (time on dialysis,%):						
0-6 months	62	57	69	71	61	40
6-24 months	18	13	17	16	18	21
2-5 years	14	17	9	10	14	25
>5 years	7	13	5	4	6	15
Marital status (%)						
Married	59	49	56	60	59	61
Single	24	38	27	24	23	22
Widowed	9	5	8	8	11	9
Divorced	8	8	9	8	8	8
Comorbid conditions (%)						
Atherosclerotic heart disease	16	12	12	17	17	16
Congestive heart failure*	18	16	17	19	18	16
Other cardiac diseases*	5	3	5	5	5	3
Cerebrovascular disease*	5	4	4	5	5	5
Peripheral vascular disease*	9	7	7	9	9	8
Chronic obstructive pulmonary disease*	4	4	3	4	4	3
Cancer*	4	5	4	4	4	4
Current smoker	5	8	5	5	5	5
Laboratory data						
Serum albumin (g/dl)	3.5 ± 0.5	3.6 ± 0.5	3.6 ± 0.4	3.6 ± 0.4	3.5 ± 0.4	3.5 ± 0.5
Serum creatinine (mg/dl)*	9.0 ± 3.6	10.6 ± 4.3	9.5 ± 3.6	8.5 ± 3.6	8.9 ± 3.5	9.5 ± 3.6
Blood hemoglobin (g/dl)	12.0 ± 1.1	11.4 ± 1.3	11.8 ± 1.1	12.0 ± 1.1	12.1 ± 1.0	12.0 ± 1.1
Serum ferritin (ng/ml)	320 (175, 549)	297 (160, 549)	307 (163, 528)	302 (166, 532)	324 (180,549)	363 (181, 596)
Serum total iron binding capacity (mg/dl)	235 ± 45	225 ± 47	233 ± 44	236 ± 45	237 ± 45	231 ± 47
Serum phosphorus (mg/dl)	5.4 ± 1.2	6.1 ± 1.5	5.8 ± 1.4	5.4 ± 1.2	5.3 ± 1.1	5.4 ± 1.2
Serum bicarbonate (mg/dl)	25 ± 3	24 ± 3	24 ± 3	25 ± 3	25 ± 3	28 ± 3
Serum parathyroid hormone (pg/ml)	346 (205, 469)	405 (347, 734)	368 (280, 611)	332 (213, 444)	312 (187, 429)	368 (190, 529)
Serum alkaline phosphatase (U/L)	102 (80.3, 133)	110 (83.7, 155)	106 (81.5, 139)	98.4 (78.7, 129)	101 (80.0, 131)	107 (83.3, 142)
White blood cell count (x10 ³ /µl)	7.8 ± 2.4	7.3 ± 2.7	7.4 ± 2.3	7.6 ± 2.2	7.9 ± 2.3	8.3 ± 2.5
Percent lymphocyte	19 ± 6	19 ± 7	19 ± 6	19 ± 6	19 ± 6	19 ± 6

Data are presented as mean ± SD, median (interquartile range), or percentage. **P*-value for difference among categories ≥0.05, all other *P*-values are <0.05.

Table S2B: Baseline characteristics by category of serum albumin-corrected calcium in patients undergoing HD.

	Albumin-corrected serum calcium category mg/dl (n)					
	Total (n =118,718)	< 8.5 (4,521)	8.5 < to 8.9 (14,286)	9.0 < to 9.4 (40,351)	9.5 < to 10.1	≥10.2 (11,696)
Age (yr)	62 ± 16	54 ± 16	60 ± 16	62 ± 15	62 ± 15	63 ± 15
Sex (% female)	45	37	36	41	50	55
Diabetes mellitus (%)	58	50	60	61	57	49
Body mass index (kg/m ²)	26.6 ± 6.56	26.8 ± 6.93	26.5 ± 6.48	26.5 ± 6.43	26.8 ± 6.68	25.9 ± 6.40
Race/ethnicity (%)						
White	43	33	41	44	43	41
Black	33	36	27	28	36	41
Hispanic	15	18	20	18	12	9
Asian	3	3	4	3	3	2
Other	7	9	8	7	6	6
Vintage (time on dialysis,%):						
0-6 months	57	47	60	63	57	39
6-24 months	16	17	18	17	16	15
2-5 years	16	18	14	14	17	24
>5 years	10	18	8	6	10	22
Marital status (%)						
Married*	47	41	48	49	47	46
Single	28	39	30	27	28	27
Widowed	16	11	14	16	17	18
Divorced*	8	9	8	8	8	8
Comorbid conditions (%)						
Atherosclerotic heart disease	21	15	20	23	21	20
Congestive heart failure*	28	23	27	29	28	26
Other cardiac diseases*	6	5	5	6	6	5
Cerebrovascular disease	8	5	7	8	8	8
Peripheral vascular disease	11	9	11	12	11	10
Chronic obstructive pulmonary disease*	6	4	6	6	6	5
Cancer	4	4	4	4	4	5
Current smoker	5	6	5	5	5	4
Laboratory data						
Serum albumin (g/dl)	3.7 ± 0.4	3.8 ± 0.4	3.7 ± 0.4	3.7 ± 0.4	3.7 ± 0.5	3.6 ± 0.5
Serum creatinine (mg/dl)	8.1 ± 3.0	9.7 ± 3.3	8.3 ± 3.0	7.8 ± 2.9	8.1 ± 3.0	8.3 ± 2.9
Blood hemoglobin (g/dl)	12.0 ± 1.0	11.8 ± 1.1	11.9 ± 1.0	12.0 ± 0.9	12.0 ± 0.9	11.8 ± 1.1
Serum ferritin (ng/ml)	506 (306, 721)	462 (269, 673)	453 (264, 662)	482 (293, 691)	526 (324, 738)	575 (366,839)
Serum total iron binding capacity (mg/dl)	204 ± 40	204 ± 41	206 ± 40	206 ± 40	204 ± 40	193 ± 42
Serum phosphorus (mg/dl)	5.5 ± 1.3	6.5 ± 1.8	5.8 ± 1.4	5.5 ± 1.2	5.4 ± 1.2	5.5 ± 1.2
Serum bicarbonate (mg/dl)	23 ± 3	21 ± 3	22 ± 3	23 ± 3	23 ± 3	23 ± 3
Serum parathyroid hormone (pg/ml)	300 (193, 386)	368 (226, 538)	309 (207, 403)	274 (188, 368)	295 (188, 376)	368 (224, 551)
Serum alkaline phosphatase (U/L)	107 (57)	109 (63)	106 (57)	105 (54)	106 (56)	115 (68)
White blood cell count (x10 ³ /μl)	7.5 ± 2.4	7.2 ± 2.4	7.3 ± 2.4	7.4 ± 2.3	7.6 ± 2.4	7.8 ± 2.7
Percent lymphocyte	20 ± 7.2	20.0 ± 7.2	20 ± 7	20 ± 7	20 ± 7	20 ± 7

Data are presented as mean ± SD, median (interquartile range), or percentage. **P*-value for difference among categories ≥0.05, all other *P*-values are <0.05.

Table S3A: Characteristics by baseline serum phosphorus category in patients undergoing PD.

	Serum phosphorus category mg/dl (n)				
	Total (n = 10,064)	≤ 4.5 (2,849)	4.5 < to 5.4 (2,587)	5.4 < to 6.4 (2,494)	> 6.4 (2,134)
Age (yr)	56 ± 15	62 ± 15	57 ± 15	53 ± 14	47 ± 14
Sex (% female)	47	47	48	48	44
Diabetes mellitus (%)	49	51	49	49	42
Body mass index (kg/m ²)	26.6 ± 6.0	26.1 ± 5.9	26.6 ± 5.8	27.8 ± 6.2	27.3 ± 6.4
Race/ethnicity (%)					
White	54	56	55	54	52
Black*	21	21	21	22	22
Hispanic	13	13	12	14	14
Asian*	5	5	7	5	4
Other	6	5	6	6	7
Vintage (time on dialysis,%):					
0-6 months	62	66	65	59	50
6-24 months	18	16	16	17	22
2-5 years	14	12	13	16	19
>5 years	7	6	5	7	9
Marital status (%)					
Married	62	63	62	62	56
Single	23	19	22	22	32
Widowed	8	6	8	7	4
Divorced	8	12	8	8	9
Comorbid conditions (%)					
Atherosclerotic heart disease	16	22	17	14	11
Congestive heart failure	18	21	18	16	14
Other cardiac diseases	4	7	4	4	3
Cerebrovascular disease	5	7	5	5	3
Peripheral vascular disease	8	11	9	8	6
Chronic obstructive pulmonary disease	4	5	3	4	5
Cancer	4	5	3	4	2
Current smoker	5	4	5	5	6
Laboratory data					
Serum albumin (g/dl)	3.5 ± 0.5	3.4 ± 0.5	3.6 ± 0.5	3.6 ± 0.4	3.7 ± 0.5
Serum creatinine (mg/dl)	9.0 ± 3.6	6.6 ± 2.8	8.4 ± 2.9	9.8 ± 3.5	11.8 ± 3.5
Blood hemoglobin (g/dl)	12.0 ± 1.0	12.2 ± 1.1	12.3 ± 1.4	12.0 ± 1.0	11.7 ± 1.2
Serum ferritin (ng/ml)	311 (171, 536)	309 (169, 550)	312 (175, 537)	315 (176, 534)	306 (165, 522)
Serum total iron binding capacity (mg/dl)	236 ± 45	233 ± 48	237 ± 45	238 ± 43	233 ± 44
Serum calcium (uncorrected; mg/dl)*	9.2 ± 0.8	9.2 ± 0.7	9.2 ± 0.8	9.3 ± 0.65	9.2 ± 0.73
Serum phosphorus (mg/dl)*	5.4 ± 1.2	3.9 ± 0.5	5.0 ± 0.2	5.9 ± 0.3	7.2 ± 0.9
Serum bicarbonate (mg/dl)*	24.9 ± 3.2	26.1 ± 2.4	25.1 ± 2.9	24.3 ± 2.9	22.9 ± 3.1
Serum parathyroid hormone (pg/ml)	303 (188, 515)	234 (147, 360)	283 (182, 448)	340 (219, 548)	459 (263, 780)
Serum alkaline phosphatase (U/L)*	102 (80.2, 133)	104 (83.0, 136)	101 (80.2, 131)	102 (78.8, 132)	100 (78.7, 134)
White blood cell count (x10 ³ /μl)*	7.8 ± 2.4	7.8 ± 2.6	7.8 ± 2.4	7.8 ± 2.4	7.8 ± 2.4
Percent lymphocyte	18.8 ± 6.79	18.9 ± 7.12	18.9 ± 6.79	18.9 ± 6.63	18.4 ± 6.6

Data are presented as mean ± SD, median (interquartile range), or percentage. **P*-value for difference among categories ≥ 0.05, all other *P*-values are < 0.05.

Table S3B: Characteristics by baseline serum phosphorus category in patients undergoing HD.

	Serum phosphorus category mg/dl (n)				
	Total (n =118,978)	< 4.5 (29,502)	4.5 < to 5.4 (29,583)	5.4 < to 6.4 (29,774)	≥6.4 (30,119)
Age (yr)	62 ± 16	68 ± 14	65 ± 14	60 ± 15	53 ± 15
Sex (% female)	45	46	48	46	42
Diabetes mellitus (%)	58	58	61	60	52
Body mass index (kg/m ²)	26.6 ± 6.0	27.3 ± 6.4	26.3 ± 5.3	27.8 ± 6.2	27.3 ± 6.4
Race/ethnicity (%)					
White	42	47	44	41	39
Black	33	31	31	34	34
Hispanic	15	14	15	16	16
Asian*	3	3	3	3	3
Other	7	6	6	7	8
Vintage (time on dialysis,%):					
0-6 months	57	64	61	56	47
6-24 months	17	15	16	17	19
2-5 years	16	13	15	17	21
>5 years	10	8	8	10	14
Marital status (%)					
Married	47	49	49	48	44
Single	28	23	26	28	36
Widowed	16	21	17	15	11
Divorced	8	7	8	9	10
Comorbid conditions (%)					
Atherosclerotic heart disease	21	26	23	20	15
Congestive heart failure	28	32	29	27	23
Other cardiac diseases	6	8	6	5	4
Cerebrovascular disease	7	10	8	7	5
Peripheral vascular disease	11	14	12	11	9
Chronic obstructive pulmonary disease	6	7	6	5	4
Cancer	4	6	5	4	3
Current smoker	5	4	4	5	7
Laboratory data					
Serum albumin (g/dl)	3.7 ± 0.4	3.6 ± 0.5	3.7 ± 0.4	3.7 ± 0.4	3.8 ± 0.4
Serum creatinine (mg/dl)	8.1 ± 3.0	6.3 ± 2.6	7.5 ± 2.5	8.6 ± 2.6	10.0 ± 2.9
Blood hemoglobin (g/dl)	12.0 ± 1.0	11.9 ± 1.1	12.0 ± 0.9	12.0 ± 0.9	11.9 ± 1.0
Serum ferritin (ng/ml)*	498 (302, 727)	509 (308,760)	506 (309, 724)	495 (303, 717)	483 (288, 713)
Serum total iron binding capacity (mg/dl)	204 ± 40	198 ± 44	205 ± 40	207 ± 39	206 ± 38
Serum calcium (uncorrected; mg/dl)	9.2 ± 0.6	9.2 ± 0.6	9.3 ± 0.6	9.3 ± 0.6	9.2 ± 0.7
Serum bicarbonate (mg/dl)	23 ± 3	24 ± 3	23 ± 2	22 ± 2	21 ± 3
Serum parathyroid hormone (pg/ml)	267 (180, 420)	203 (135, 289)	240 (170,340)	282 (198, 420)	402 (256, 672)
Serum alkaline phosphatase (U/L)	107 (170,340)	110 (86.5, 145)	106 (84.5, 140)	105 (83.4, 139)	106 (83.2, 143)
White blood cell count (x10 ³ /µl)	7.5 ± 2.4	7.6 ± 2.7	7.4 ± 2.3	7.4 ± 2.2	7.5 ± 2.3
Percent lymphocyte	20.0 ± 7.2	19.4 ± 7.4	20.1 ± 7.1	20.4 ± 7.1	20.2 ± 7.0

Data are presented as mean ± SD, median (interquartile range), or percent. **P*-value for difference among categories ≥0.05, all other *P*-values are <0.05.

Table S4: Sensitivity analysis – Adjusted hazard ratios for association of categories of uncorrected albumin-corrected serum calcium with all-cause, cardiovascular, and infection-related mortality in patients treated with PD and HD, adjusted for additional laboratory covariates (PD, n = 10,066; HD, n = 118,955)

	Uncorrected serum calcium (mg/dl)	All-cause mortality ^a	Cardio-vascular mortality ^a	Infection-related mortality ^a
PD Patients	<8.5	1.20 (1.08, 1.34)	1.11 (0.94, 1.32)	1.18 (0.93, 1.50)
	8.5-<9.0	1.07 (0.98, 1.17)	1.04 (0.92, 1.19)	1.11 (0.92, 1.34)
	9.0-<9.5	Reference	Reference	Reference
	9.5-<10.2	1.07 (0.98, 1.16)	0.99 (0.87, 1.13)	1.10 (0.91, 1.32)
	≥10.2	1.61 (1.39, 1.87)	1.41 (1.15, 1.84)	1.53 (1.10, 2.12)
HD Patients	<8.5	1.10 (1.06, 1.13)	1.07 (1.02, 1.12)	1.08 (1.01, 1.16)
	8.5-<9.0	1.09 (1.06, 1.11)	1.07 (1.04, 1.11)	1.11 (1.05, 1.17)
	9.0-<9.5	Reference	Reference	Reference
	9.5-<10.2	1.04 (1.02, 1.06)	1.07 (1.03, 1.10)	1.02 (0.97, 1.08)
	≥10.2	1.58 (1.52, 1.64)	1.63 (1.54, 1.72)	1.46 (1.34, 1.59)

PD, peritoneal dialysis; HD, hemodialysis.

^a Data adjusted for age, sex, diabetes, race and/or ethnicity, primary insurance, marital status, dialysis vintage category (<6 months, 6 months to 2 years, 2-5 years, and >5 years), body mass index, atherosclerotic heart disease, cancer, congestive heart failure, other cardiac diseases, cerebrovascular disease, peripheral vascular disease, chronic obstructive pulmonary disease, tobacco smoking, serum albumin, total iron binding capacity, serum creatinine, serum white blood cell count, serum lymphocyte percentage, body mass index, serum bicarbonate, serum phosphorus, and parathyroid hormone

Table S5: Sensitivity analysis - association of categories of time-averaged albumin-corrected serum calcium with all-cause, cardiovascular, and infection-related mortality in patients treated with PD and HD, adjustment for additional laboratory covariates (PD, n = 10,066; HD, n = 118,955)

	Albumin-corrected serum calcium (mg/dl)	All-cause mortality ^a	Cardio-vascular mortality ^a	Infection-related mortality ^a
PD Patients	<8.5	1.30 (1.07, 1.59)	1.10 (0.80, 1.50)	1.34 (0.89, 2.02)
	8.5-<9.0	1.16 (1.02, 1.32)	1.05 (0.86, 1.28)	1.06 (0.79, 1.42)
	9.0-<9.5	Reference	Reference	Reference
	9.5-<10.2	0.95 (0.88, 1.02)	0.95 (0.84, 1.07)	0.93 (0.78, 1.11)
	≥10.2	1.21 (1.09, 1.34)	1.13 (0.97, 1.32)	1.11 (0.89, 1.39)
HD Patients	<8.5	1.19 (1.14, 1.25)	1.14 (0.96, 1.23)	1.18 (1.05, 1.32)
	8.5-<9.0	1.07 (1.04, 1.10)	1.07 (1.02, 1.11)	1.06 (0.99, 1.13)
	9.0-<9.5	Reference	Reference	Reference
	9.5-<10.2	0.99 (0.97, 1.01)	1.02 (0.99, 1.05)	0.98 (0.94, 1.03)
	≥10.2	1.29 (1.25, 1.32)	1.36 (1.30, 1.42)	1.23 (1.15, 1.31)

PD, peritoneal dialysis; HD, hemodialysis.

^a Data adjusted for age, sex, diabetes, race and/or ethnicity, primary insurance, marital status, dialysis vintage category (<6 months, 6 months to 2 years, 2-5 years, and >5 years), body mass index, atherosclerotic heart disease, cancer, congestive heart failure, other cardiac diseases, cerebrovascular disease, peripheral vascular disease, chronic obstructive pulmonary disease, tobacco smoking, serum albumin, total iron binding capacity, serum creatinine, serum white blood cell count, serum lymphocyte percentage, body mass index, serum bicarbonate, serum phosphorus, and parathyroid hormone

Table S6: Sensitivity analysis - association of categories of time-averaged serum phosphorus with all-cause, cardiovascular, and infection-related mortality in patients treated with PD and HD, adjustment for additional laboratory covariates (PD, n = 10,066; HD, n = 118,955)

	Serum phosphorus (mg/dl)	All-cause mortality ^a		Cardio-vascular mortality ^a		Infection-related mortality ^a
PD Patients	≤ 4.5	1.03 (0.94, 1.12)		1.00 (0.87, 1.15)		0.96 (0.79, 1.16)
	4.5 -5.4	Reference		Reference		Reference
	5.4-6.4	1.10 (1.01, 1.21)		1.21 (1.05, 1.40)		0.92 (0.75, 1.12)
	≥ 6.4	1.49 (1.34, 1.65)		1.78 (1.52, 2.09)		1.29 (1.03, 1.62)
HD Patients	≤ 4.5	1.06 (1.03, 1.08)		1.03 (0.99, 1.07)		1.08 (1.02, 1.14)
	4.5 -5.4	Reference		Reference		Reference
	5.4-6.4	1.13 (1.10, 1.16)		1.18 (1.14, 1.22)		1.14 (1.08, 1.21)
	≥ 6.4	1.53 (1.49, 1.56)		1.70 (1.63, 1.76)		1.54 (1.45, 1.63)

PD, peritoneal dialysis; HD, hemodialysis.

^a Data adjusted for age, sex, diabetes, race and/or ethnicity, primary insurance, marital status, dialysis vintage category (<6 months, 6 months to 2 years, 2-5 years, and >5 years), body mass index, atherosclerotic heart disease, cancer, congestive heart failure, other cardiac diseases, cerebrovascular disease, peripheral vascular disease, chronic obstructive pulmonary disease, tobacco smoking, serum albumin, total iron binding capacity, serum creatinine, serum white blood cell count, serum lymphocyte percentage, body mass index, serum bicarbonate, serum calcium, and parathyroid hormone