

SUPPLEMENTARY MATERIALS

Residual Kidney Function Decline and Mortality in Incident Hemodialysis Patients

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Supplemental Tables

Supplemental Table 1. Baseline demographic and clinical characteristics in 67,311 incident in-center hemodialysis patients who survived their first year of treatment and who were treated with conventional hemodialysis only: 6,538 (10%) patients included in the study who had residual renal urea clearance (CL_{urea}) data both at baseline and Year 1 vs. 12,049 (19%) excluded from the study with CL_{urea} at baseline but not at Year 1 vs. 44,416 (70%) excluded from the study without baseline CL_{urea} data.

Variable	With CL _{urea} data both at baseline and Year 1 (n=6,538, 10%)	With CL _{urea} data at baseline but not at Year 1 (n=16,357, 24%)	StdDiff.	Without CL _{urea} data at baseline (n=44,416, 66%)	StdDiff.
Renal CL _{urea} (mL/min/1.73 m ²)	3.4 (IQR: 2.1, 5.1)	3.0 (IQR: 1.7, 4.7)	20%	N/A	
Urine volume (mL/day)	900 (IQR: 550, 1,400)	800 (IQR: 475, 1,300)	19%	N/A	
Age (years)	62 (SD, 14)	61 (SD, 15)	9%	62 (SD, 15)	2%
Male (%)	65%	62%	5%	53%	24%
<i>Race (%)</i>					
Non-Hispanic White	56%	49%	14%	39%	34%
Non-Hispanic Black	25%	32%	16%	36%	23%
Hispanic and others	19%	19%	<1%	26%	15%
<i>Primary insurance (%)</i>					
Medicare	52%	50%	4%	53%	3%
Medicaid	7%	7%	2%	8%	6%
Others	42%	43%	3%	39%	6%
<i>Access (%)</i>					
Central Venous Catheter	68%	73%	10%	72%	9%
AV fistula/graft	27%	22%	10%	19%	17%
Unknown	5%	5%	2%	8%	12%
<i>Comorbidities (%)</i>					
Hypertension	52%	52%	<1%	54%	3%

Diabetes	68%	67%	2%	69%	1%
Congestive heart failure	47%	45%	4%	45%	3%
Atherosclerotic heart disease	16%	16%	1%	17%	3%
Other cardiovascular disease	18%	16%	5%	17%	3%
Body mass index (kg/m ²)	27.7 (IQR: 24.0, 32.8)	27.7 (IQR: 23.8, 33.2)	<1%	26.6 (IQR: 23.0, 31.7)	17%
Single-pool Kt/V	1.30 (SD, 0.27)	1.32 (SD, 0.28)	7%	1.46 (SD, 0.31)	54%
nPCR (g/kg/day)	1.0 (SD, 0.3)	1.0 (SD, 0.3)	12%	N/A	
<i>Laboratory variables</i>					
Hemoglobin (g/dL)	11.5 (SD, 1.0)	11.4 (SD, 1.1)	16%	11.3 (SD, 1.2)	22%
Albumin (mg/dL)	3.64 (SD, 0.42)	3.58 (SD, 0.45)	14%	3.52 (SD, 0.46)	27%
Creatinine (mg/dL)	6.0 (SD, 2.2)	6.1 (SD, 2.4)	6%	6.1 (SD, 2.4)	5%
Calcium (mg/dL)	9.1 (SD, 0.5)	9.1 (SD, 0.5)	4%	9.1 (SD, 0.6)	4%
Phosphorus (mg/dL)	5.1 (SD, 1.1)	5.1 (SD, 1.1)	<1%	5.0 (SD, 1.2)	7%
Intact PTH (pg/mL)	313 (IQR: 207, 461)	325 (IQR: 215, 491)	7%	322 (IQR: 206, 493)	5%
Iron saturation (%)	23 (SD, 8)	23 (SD, 8)	<1%	23 (SD, 8)	6%
Ferritin (pg/nL)	243 (IQR: 140, 403)	255 (IQR: 148, 429)	7%	265 (IQR: 154, 457)	13%
Bicarbonate (mmol/L)	23.2 (SD, 2.5)	23.3 (SD, 2.6)	7%	23.5 (SD, 2.7)	11%

Note: Values are expressed as mean (SD), median (IQR), or percentage, appropriately. Standardized differences of 80%, 50%, and 20% were considered large, medium, and small differences, and $\geq 10\%$ was defined as meaningful imbalance against 6,538 included patients. Abbreviations: nPCR, normalized protein-catabolic rate, PTH, parathyroid hormone; StdDiff, standardized difference. Conversion factors for units: albumin and hemoglobin in g/dL to g/L, 10; creatinine in mg/dL to mmol/L, 88.4; calcium in mg/dL to mmol/L, 0.2495; phosphorus in mg/dL to mmol/L, 0.3229. No conversion is necessary for ferritin in ng/mL and mg/L.

Supplemental Table 2. Association of baseline characteristics with annual change in renal urea clearance (CL_{urea}) among 5,587 incident hemodialysis patients who had baseline CL_{urea} >1.5 mL/min/1.73m².

	Case-mix adjusted model		Fully adjusted model	
	β (95%CI)	P	β (95%CI)	P
CL _{urea} (per 1 mL/min/1.73m ²)	-0.61 (-0.64 to -0.58)	<0.001	-0.71 (-0.74 to -0.67)	<0.001
Age (years)				
<50	-0.06 (-0.23 to 0.12)	0.51	0.19 (0.02 to 0.37)	0.03
50 to <60	-0.13 (-0.28 to 0.02)	0.09	-0.01 (-0.16 to 0.13)	0.85
60 to <70	Reference		Reference	
70 to <80	-0.05 (-0.20 to 0.10)	0.52	-0.16 (-0.31 to -0.01)	0.04
80 or more	-0.26 (-0.45 to -0.07)	0.008	-0.47 (-0.66 to -0.27)	<0.001
Male	-0.02 (-0.14 to 0.10)	0.71	0.24 (0.11 to 0.37)	<0.001
Race/Ethnicity				
Non-Hispanic white	Reference		Reference	
Non-Hispanic black	-0.31 (-0.44 to -0.18)	<0.001	-0.11 (-0.25 to 0.03)	0.13
Hispanic and others	-0.28 (-0.42 to -0.14)	<0.001	-0.08 (-0.22 to 0.06)	0.24
MediCare as primary insurance	-0.05 (-0.16 to 0.06)	0.38	-0.06 (-0.17 to 0.04)	0.25
Central venous catheter use	0.06 (-0.05 to 0.16)	0.31	0.17 (0.06 to 0.28)	0.003
<i>Comorbidities</i>				
Hypertension	-0.02 (-0.13 to 0.09)	0.79	0.01 (-0.09 to 0.12)	0.81
Diabetes	-0.17 (-0.29 to -0.04)	0.007	-0.17 (-0.30 to -0.04)	0.008
Congestive heart failure	-0.34 (-0.45 to -0.23)	<0.001	-0.30 (-0.40 to -0.19)	<0.001
Atherosclerotic heart disease	0.15 (-0.01 to 0.32)	0.07	0.16 (-0.01 to 0.32)	0.06
Other cardiovascular disease	0.02 (-0.15 to 0.18)	0.85	-0.02 (-0.17 to 0.14)	0.84
Single-pool Kt/V (per SD)	0.01 (-0.05 to 0.07)	0.69	0.01 (-0.06 to 0.07)	0.82
Body mass index (per SD)	0.09 (0.02 to 0.15)	0.008	0.08 (0.01 to 0.14)	0.02
nPCR (g/kg/day)				
<0.8	0.22 (0.05 to 0.40)	0.01	0.15 (-0.03 to 0.32)	0.10
0.8 to <1.0	-0.01 (-0.15 to 0.13)	0.90	-0.06 (-0.20 to 0.08)	0.37
1.0 to <1.2	Reference		Reference	
1.2 or more	-0.07 (-0.22 to 0.09)	0.41	-0.02 (-0.17 to 0.13)	0.83

Laboratories

Hemoglobin (per SD)		0.10 (0.04 to 0.15)	0.001	0.07 (0.01 to 0.13)	0.02
Albumin (g/dL)					
	<3.2	-0.67 (-0.83 to -0.51)	<0.001	-0.81 (-0.97 to -0.65)	<0.001
	3.2 to <3.6	-0.32 (-0.46 to -0.19)	<0.001	-0.40 (-0.53 to -0.27)	<0.001
	3.6 to <4.0	Reference		Reference	
	4.0 or more	0.07 (0.01 to 0.12)	0.01	0.33 (0.17 to 0.48)	<0.001
Creatinine (per SD)		-0.41 (-0.48 to -0.34)	<0.001	-0.41 (-0.50 to -0.33)	<0.001
Calcium (per SD)		0.07 (0.01 to 0.12)	0.01	0.07 (0.02 to 0.12)	0.008
Phosphorous (per SD)		-0.32 (-0.37 to -0.26)	<0.001	-0.19 (-0.25 to -0.12)	<0.001
Intact PTH (pg/mL)					
	<160	0.28 (0.11 to 0.46)	0.002	0.13 (-0.05 to 0.31)	0.15
	160 to <320	0.20 (0.07 to 0.32)	0.002	0.10 (-0.02 to 0.23)	0.09
	320 to <640	Reference		Reference	
	640 or more	-0.22 (-0.37 to -0.07)	0.004	-0.11 (-0.26 to 0.04)	0.16
Iron saturation (per SD)		-0.05 (-0.10 to 0.01)	0.09	-0.06 (-0.12 to -0.01)	0.03
Ferritin (ng/mL)					
	<200	-0.09 (-0.24 to 0.07)	0.27	-0.09 (-0.24 to 0.06)	0.24
	200 to <400	-0.06 (-0.22 to 0.10)	0.45	-0.06 (-0.22 to 0.09)	0.43
	400 to <800	Reference		Reference	
	800 or more	0.18 (-0.12 to 0.48)	0.24	0.24 (-0.05 to 0.54)	0.11
Bicarbonate (per SD)		0.00 (-0.06 to 0.05)	0.92	-0.15 (-0.20 to -0.09)	<0.001

Note: Case-mix variables included baseline urine volume, age, sex, race/ethnicity, primary insurance, central venous catheter use, comorbidities, and single-pool Kt/V. Abbreviations: nPCR, normalized protein-catabolic rate; PTH, parathyroid hormone.

Supplemental Table 3. Characteristics of 6,538 incident hemodialysis patients who have residual renal urea clearance data**both at baseline and one year after initiating dialysis stratified by annual change in urine volume.**

Variable	Total (n=6,538)	Annual change in urine volume				<i>P</i> _{trend}
		<-600 mL/day (n=1,468, 22%)	-600 to <-300 mL/day (n=1,218, 19%)	-300 to <0 mL/day (n=1,566, 24%)	≥0 mL/day (n=2,286, 35%)	
Urine volume (mL/day)	900 (IQR: 550, 1,400)	4.8 (IQR: 3.5, 6.4)	3.6 (IQR: 2.5, 5.1)	2.9 (IQR: 1.8, 4.4)	2.7 (IQR: 1.5, 4.2)	<0.001
Renal CL _{urea} (mL/min/1.73 m ²)	3.4 (IQR: 2.1, 5.1)	1,550 (IQR: 1,250, 2,000)	1,000 (IQR: 750, 1,300)	700 (IQR: 500, 1,025)	600 (IQR: 400, 1,000)	<0.001
Age (years)	62 ± 14	59 ± 14	63 ± 14	64 ± 14	62 ± 14	<0.001
Male (%)	65%	72%	66%	61%	61%	<0.001
<i>Race/Ethnicity (%)</i>						
Non-Hispanic white	56%	54%	55%	55%	57%	0.08
Non-Hispanic black	25%	23%	27%	26%	25%	0.21
Hispanic and others	19%	23%	18%	19%	17%	<0.001
<i>Primary insurance (%)</i>						
Medicare	52%	48%	51%	56%	52%	0.004
Medicaid	7%	8%	6%	7%	6%	0.02
Others	42%	44%	43%	38%	42%	0.08
<i>Access (%)</i>						
Central Venous Catheter	68%	66%	66%	67%	71%	0.001
AV fistula/graft	27%	28%	29%	27%	24%	0.002
Unknown	5%	6%	5%	6%	5%	0.53
<i>Comorbidities (%)</i>						
Hypertension	52%	49%	54%	54%	52%	0.08
Diabetes	68%	72%	69%	67%	67%	0.001
Congestive heart failure	47%	51%	48%	46%	44%	<0.001
Atherosclerotic heart disease	16%	16%	16%	15%	17%	0.64
Other cardiovascular disease	18%	17%	17%	19%	18%	0.60

Body mass index (kg/m ²)	27.7 (IQR: 24.0, 32.8)	28.2 (IQR: 24.5, 33.5)	27.2 (IQR: 23.8, 31.8)	27.3 (IQR: 23.6, 32.4)	27.9 (IQR: 24.2, 33.0)	0.67
Single-pool Kt/V	1.30 ± 0.27	1.24 ± 0.26	1.30 ± 0.28	1.32 ± 0.26	1.32 ± 0.28	<0.001
Ultrafiltration rate (L/hour)	0.58 ± 0.24	0.60 ± 0.25	0.58 ± 0.24	0.58 ± 0.24	0.57 ± 0.23	<0.001
nPCR (g/kg/day)	1.0 ± 0.3	1.11 ± 0.29	1.04 ± 0.28	0.99 ± 0.26	0.95 ± 0.27	<0.001
<i>Laboratory variables</i>						
Hemoglobin (g/dL)	11.5 ± 1.0	11.6 ± 1.0	11.6 ± 1.0	11.5 ± 1.0	11.5 ± 1.0	0.009
Albumin (mg/dL)	3.64 ± 0.42	3.62 ± 0.43	3.66 ± 0.41	3.62 ± 0.41	3.65 ± 0.42	0.04
Creatinine (mg/dL)	6.0 ± 2.2	6.1 ± 2.3	6.1 ± 2.2	5.9 ± 2.1	5.9 ± 2.2	<0.001
Calcium (mg/dL)	9.1 ± 0.5	9.1 ± 0.5	9.1 ± 0.5	9.1 ± 0.5	9.1 ± 0.5	0.11
Phosphorus (mg/dL)	5.1 ± 1.1	5.2 ± 1.1	5.1 ± 1.1	5.0 ± 1.1	5.0 ± 1.1	<0.001
Intact PTH (pg/mL)	313 (IQR: 207, 461)	319 (IQR: 210, 474)	326 (IQR: 214, 477)	302 (IQR: 204, 446)	310 (IQR: 206, 450)	0.04
Iron saturation (%)	23 ± 8	22 ± 8	23 ± 8	23 ± 8	22 ± 8	0.37
Ferritin (pg/nL)	243 (IQR: 140, 403)	218 (IQR: 131, 361)	240 (IQR: 142, 393)	253 (IQR: 140, 417)	253 (IQR: 144, 428)	<0.001
Bicarbonate (mmol/L)	23.2 ± 2.5	22.9 ± 2.4	23.1 ± 2.5	23.3 ± 2.6	23.2 ± 2.5	<0.001

Note: Values are expressed as mean±SD, median (IQR), or percentage, appropriately. Abbreviations: CL_{urea}, urea clearance; nPCR, normalized protein-catabolic rate, PTH, parathyroid hormone; StdDiff, standardized difference. Conversion factors for units: albumin and hemoglobin in g/dL to g/L, 10; creatinine in mg/dL to mmol/L, 88.4; calcium in mg/dL to mmol/L, 0.2495; phosphorus in mg/dL to mmol/L, 0.3229. No conversion is necessary for ferritin in ng/mL and mg/L.

Supplemental Table 4. Association of baseline characteristics with annual change in urine volume among 6,538 incident hemodialysis patients.

	Case-mix adjusted model		Fully adjusted model	
	β (95% CI)	<i>P</i>	β (95% CI)	<i>P</i>
Urine volume (per 200 mL/day)	-124 (-129 to -119)	<0.001	-131 (-136 to -125)	<0.001
Age (years)				
<50	46 (5 to 87)	0.03	88 (47 to 130)	<0.001
50 to <60	20 (-17 to 56)	0.30	38 (2 to 74)	0.04
60 to <70	Reference		Reference	
70 to <80	-68 (-100 to -35)	<0.001	-82 (-114 to -49)	<0.001
80 or more	-162 (-198 to -126)	<0.001	-181 (-219 to -144)	<0.001
Male	6 (-20 to 33)	0.64	64 (36 to 92)	<0.001
Race/Ethnicity				
Non-Hispanic white	Reference		Reference	
Non-Hispanic black	-124 (-154 to -95)	<0.001	-100 (-132 to -68)	<0.001
Hispanic and others	-68 (-101 to -35)	<0.001	-25 (-58 to 8)	0.14
Medicare as primary insurance	-18 (-43 to 7)	0.17	-17 (-42 to 7)	0.17
Central venous catheter use	-27 (-53 to -1)	0.04	3 (-24 to 29)	0.85
<i>Comorbidities</i>				
Hypertension	-6 (-31 to 20)	0.67	-1 (-25 to 24)	0.95
Diabetes	-34 (-62 to -7)	0.02	-36 (-65 to -7)	0.01
Congestive heart failure	-77 (-102 to -52)	<0.001	-73 (-98 to -49)	<0.001
Atherosclerotic heart disease	26 (-10 to 62)	0.16	25 (-10 to 61)	0.16
Other cardiovascular disease	-5 (-39 to 30)	0.78	-8 (-42 to 26)	0.66
Single-pool Kt/V (per SD)	-23 (-36 to -9)	0.001	-10 (-24 to 4)	0.15
Body mass index (per SD)	39 (25 to 53)	<0.001	36 (21 to 50)	<0.001
nPCR (g/kg/day)				
<0.8	7 (-30 to 43)	0.71	15 (-22 to 51)	0.43
0.8 to <1.0	-8 (-43 to 26)	0.64	-8 (-42 to 25)	0.63
1.0 to <1.2	Reference		Reference	
1.2 or more	-16 (-54 to 23)	0.42	-13 (-50 to 25)	0.51
<i>Laboratories</i>				
Hemoglobin (per SD)	5 (-7 to 17)	0.45	-4 (-17 to 9)	0.56
Albumin (g/dL)				
<3.2	-156 (-193 to -120)	<0.001	-173 (-212 to -135)	<0.001
3.2 to <3.6	-65 (-94 to -35)	<0.001	-76 (-105 to -46)	<0.001
3.6 to <4.0	Reference		Reference	
4.0 or more	9 (-5 to 23)	0.19	80 (44 to 115)	<0.001
Creatinine (per SD)	-56 (-70 to -42)	<0.001	-69 (-85 to -52)	<0.001

Calcium (per SD)	9 (-5 to 23)	0.19	21 (7 to 36)	0.004
Phosphorous (per SD)	-50 (-63 to -37)	<0.001	-36 (-51 to -21)	<0.001
Intact PTH (pg/mL)				
<160	-5 (-42 to 32)	0.78	-31 (-69 to 7)	0.11
160 to <320	7 (-22 to 36)	0.62	-12 (-40 to 17)	0.42
320 to <640	Reference		Reference	
640 or more	11 (-31 to 53)	0.60	31 (-11 to 73)	0.14
Iron saturation (per SD)	-12 (-25 to 1)	0.07	-10 (-23 to 3)	0.12
Ferritin (ng/mL)				
<200	-1 (-33 to 32)	0.97	-12 (-44 to 21)	0.48
200 to <400	-13 (-46 to 20)	0.44	-18 (-50 to 15)	0.29
400 to <800	Reference		Reference	
800 or more	29 (-29 to 87)	0.33	47 (-10 to 105)	0.11
Bicarbonate (per SD)	-25 (-38 to -13)	<0.001	-49 (-63 to -36)	<0.001

Note: Case-mix variables included baseline urine volume, age, sex, race/ethnicity, primary insurance,

central venous catheter use, comorbidities, and single-pool Kt/V. Abbreviations: nPCR, normalized

protein-catabolic rate; PTH, parathyroid hormone.

Supplemental Table 5. Association of baseline characteristics with annual change in urine volume among 5,933 incident hemodialysis patients who had baseline urine volume >300 mL/day.

		Case-mix adjusted model		Fully adjusted model	
		β (95%CI)	<i>P</i>	β (95%CI)	<i>P</i>
Urine volume (per 200 mL/day)		-124 (-130 to -119)	<0.001	-132 (-137 to -126)	<0.001
Age (years)					
	<50	50 (6 to 94)	0.03	93 (49 to 138)	<0.001
	50 to <60	27 (-12 to 66)	0.17	47 (8 to 85)	0.02
	60 to <70	Reference		Reference	
	70 to <80	-68 (-103 to -33)	<0.001	-82 (-117 to -47)	<0.001
	80 or more	-170 (-209 to -131)	<0.001	-193 (-233 to -153)	<0.001
Male		3 (-25 to 32)	0.81	65 (35 to 96)	<0.001
Race/Ethnicity					
	Non-Hiapanic white	Reference		Reference	
	Non-Hiapanic black	-128 (-161 to -96)	<0.001	-101 (-135 to -66)	<0.001
	Hiapanic and Others	-67 (-102 to -32)	<0.001	-21 (-56 to 14)	0.25
Medicare as primary insurance		-17 (-44 to 11)	0.23	-16 (-42 to 11)	0.24
Central venous catheter use		-32 (-60 to -4)	0.03	1 (-27 to 30)	0.93
<i>Comorbidities</i>					
	Hypertension	-4 (-31 to 23)	0.78	3 (-24 to 29)	0.83
	Diabetes	-30 (-60 to -1)	0.04	-31 (-63 to 0)	0.05
	Congestive heart failure	-83 (-110 to -56)	<0.001	-78 (-105 to -52)	<0.001
	Atherosclerotic heart disease	29 (-10 to 68)	0.15	28 (-10 to 66)	0.15
	Other cardiovascular disease	-2 (-39 to 36)	0.93	-4 (-41 to 33)	0.84
Single-pool Kt/V (per SD)		-23 (-38 to -8)	0.002	-10 (-25 to 5)	0.19
Body mass index (per SD)		40 (24 to 55)	<0.001	36 (21 to 51)	<0.001
nPCR (g/kg/day)					
	<0.8	3 (-37 to 42)	0.89	10 (-30 to 49)	0.63
	0.8 to <1.0	-9 (-45 to 27)	0.62	-9 (-44 to 27)	0.63
	1.0 to <1.2	Reference		Reference	
	1.2 or more	-16 (-55 to 23)	0.42	-15 (-53 to 24)	0.45

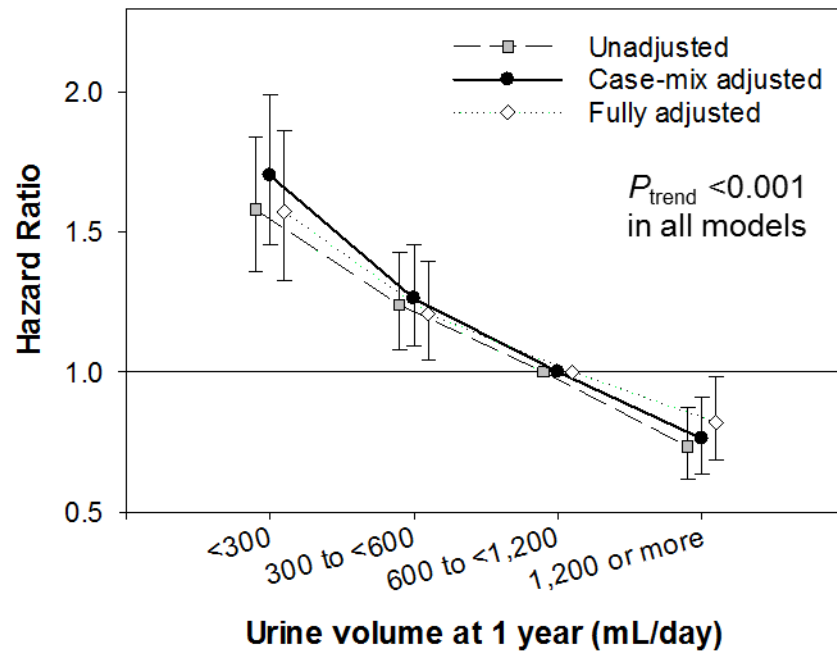
Laboratories

Hemoglobin (per SD)		5 (-8 to 18)	0.45	-4 (-18 to 10)	0.56
Albumin (g/dL)					
	<3.2	-174 (-214 to -133)	<0.001	-190 (-232 to -149)	<0.001
	3.2 to <3.6	-62 (-94 to -30)	<0.001	-74 (-105 to -42)	<0.001
	3.6 to <4.0	Reference		Reference	
	4.0 or more	10 (-5 to 25)	0.18	87 (50 to 124)	<0.001
Creatinine (per SD)		-63 (-78 to -47)	<0.001	-77 (-96 to -59)	<0.001
Calcium (per SD)		10 (-5 to 25)	0.18	23 (8 to 39)	0.003
Phosphorous (per SD)		-53 (-67 to -39)	<0.001	-35 (-51 to -19)	<0.001
Intact PTH (pg/mL)					
	<160	-10 (-50 to 30)	0.63	-38 (-79 to 3)	0.07
	160 to <320	9 (-22 to 39)	0.59	-11 (-42 to 19)	0.46
	320 to <640	Reference		Reference	
	640 or more	10 (-35 to 55)	0.67	31 (-14 to 76)	0.18
Iron saturation (per SD)		-11 (-25 to 3)	0.12	-9 (-23 to 5)	0.20
Ferritin (ng/mL)					
	<200	6 (-29 to 42)	0.73	-3 (-38 to 32)	0.87
	200 to <400	-7 (-43 to 29)	0.72	-10 (-45 to 25)	0.58
	400 to <800	Reference		Reference	
	800 or more	40 (-25 to 106)	0.23	56 (-8 to 121)	0.09
Bicarbonate (per SD)		-28 (-42 to -15)	<0.001	-53 (-67 to -39)	<0.001

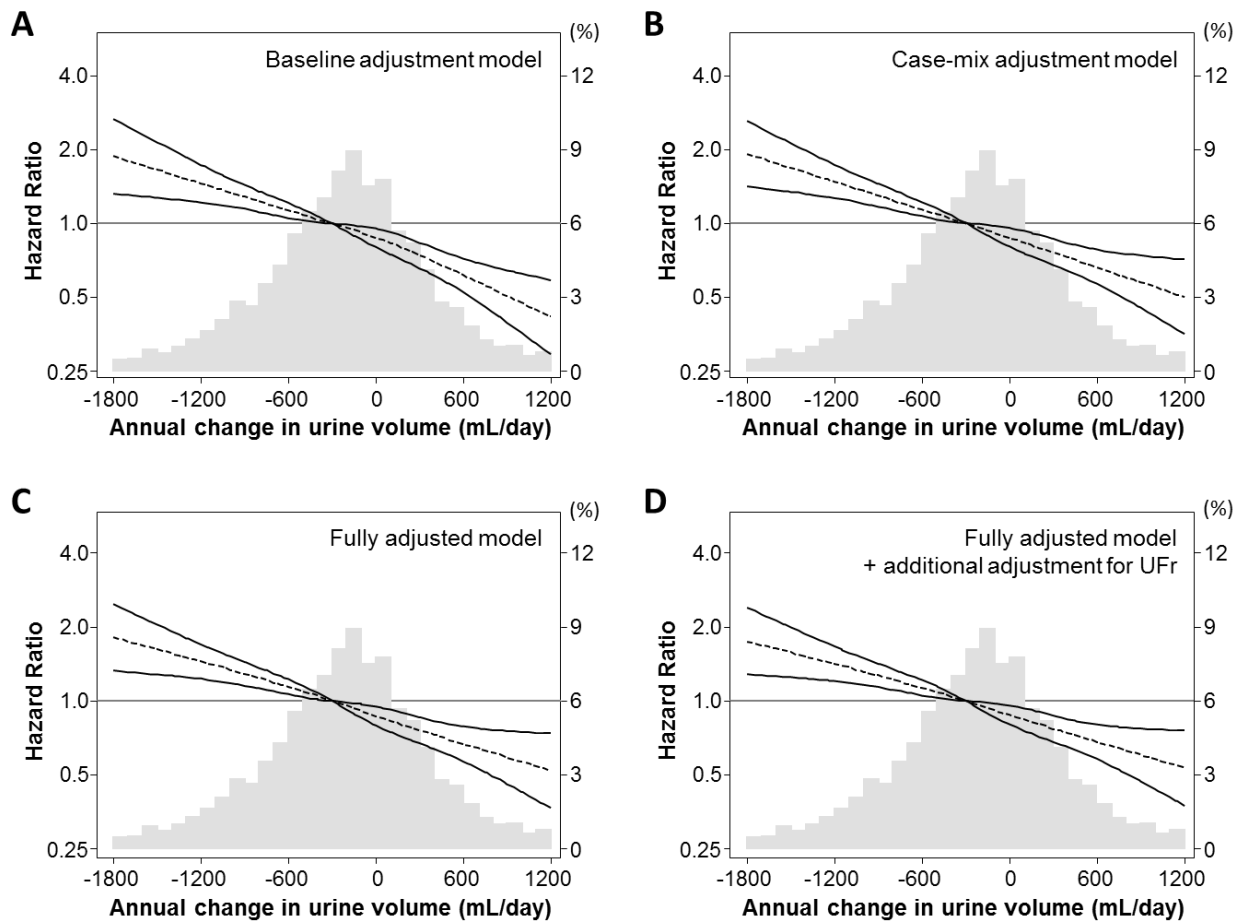
Note: Case-mix variables included baseline urine volume, age, sex, race/ethnicity, primary insurance, central venous catheter use, comorbidities, and single-pool Kt/V. Abbreviations: nPCR, normalized protein-catabolic rate; PTH, parathyroid hormone.

Supplemental Figures

Supplemental Figure 1. The mortality risk associated with urine volume at one year after initiating dialysis in 6,538 incident hemodialysis patients (2007-2010) with three levels of adjustment.



Supplemental Figure 2. Frequency distributions and restricted cubic splines comparing the relationship of annual change in urine volume with all-cause mortality in 6,538 incident hemodialysis patients (2007-2010); (A) baseline urine volume adjustment model, (B) case-mix adjustment model, (C) fully-adjusted model, and (D) additional adjustment for baseline ultrafiltration rate (UFR) and its annual change on the fully-adjusted model. Solid and dashed lines represent HR estimates and 95% CIs, respectively.

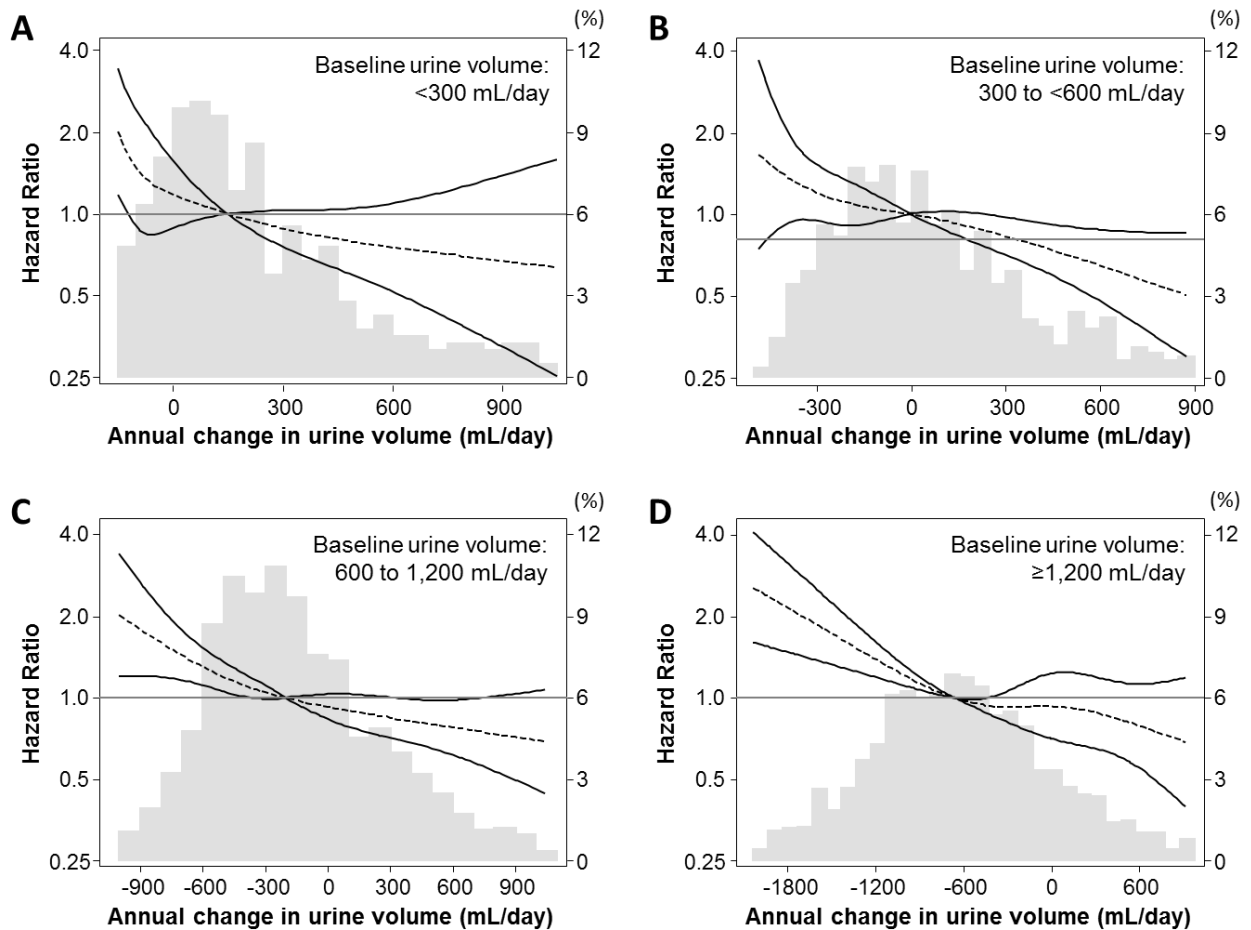


Supplemental Figure 3. Frequency distributions and casemix-adjusted all-cause death

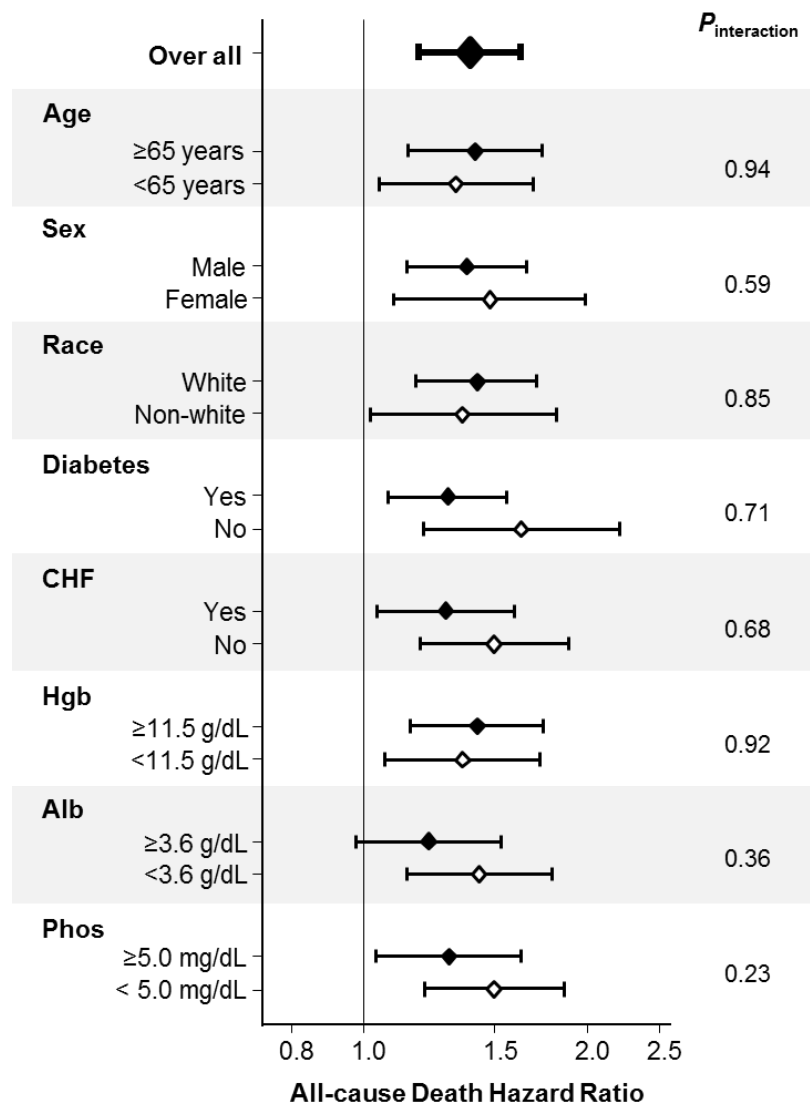
hazard ratios of annual change in urine volume by using restricted cubic splines among

6,538 incident hemodialysis patients (2007-2010) stratified by baseline urine volume levels;

(A) <300 mL/day, (B) 300 to <600 mL/day, (C) 600 to <1,200 mL/day, and (D) 1,200 mL/day or more. Dashed and solid lines represent HR estimates and 95% CIs, respectively.

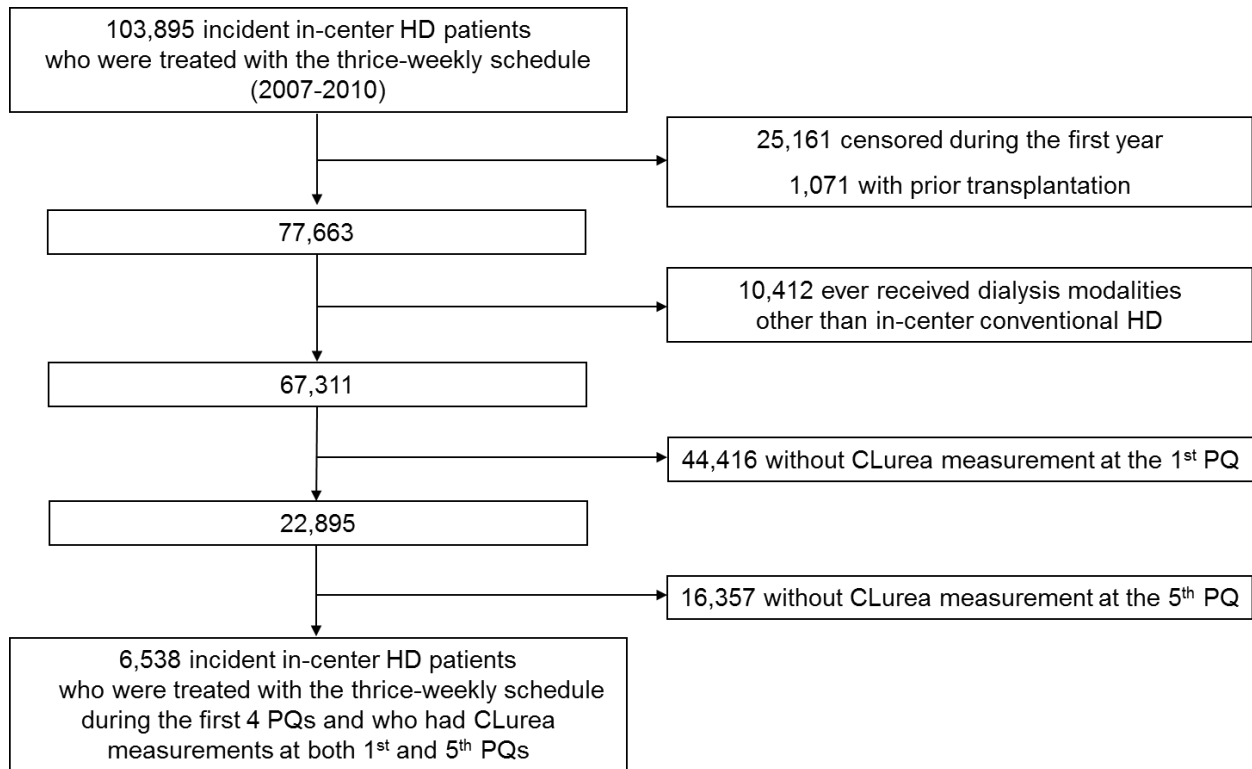


Supplemental Figure 4. Overall and subgroup analyses of association between rapid decline in urine volume >600 mL/day/year and all-cause mortality among 6,538 incident hemodialysis patients (2007-2010). Points and bars represent HR estimates and 95% CIs, respectively.



Abbreviations: CHF, history of congestive heart failure; Hgb, hemoglobin; Alb, albumin; Phos, phosphorus.

Supplemental Figure 5. Study flow diagram.



Abbreviations: HD, hemodialysis; CL_{urea}, residual renal urea clearance; PQ, patient-quarter (i.e., quarterly period from initiating hemodialysis in each patient).

Supplemental Figure 6. Scatter plot between calculated CL_{urea} and CL_{urea} from the large dialysis organization (LDO). CL_{urea} was reported as zero from the LDO when serum urea nitrogen was not measured simultaneously, and thus we calculated CL_{urea} by using pre-dialysis serum urea nitrogen on the closest day within ± 28 days to each urine collection. Values were adjusted to body surface area, quarterly averaged, and then used in all analyses. We excluded observations with $CL_{urea} > 15$ mL/min/1.73m² or urine volume $> 3,000$ mL/day from this study.

