

SUPPLEMENTARY MATERIALS**Supplementary Table 1. Baseline characteristics in patients with death events according to presence or absence of cause of death (*n* = 5,711)**

Variable	Cause of death		<i>P</i>
	Present (<i>n</i> = 2,880)	Absent (<i>n</i> = 2,831)	
Age (years)	69.6±10.9	68.5±10.7	<0.001
Gender (male)	2,847 (98.9)	2,788 (98.5)	0.22
Race (African-American)	733 (25.5)	830 (29.3)	<0.001
Marital status (married)	1,381 (48.0)	1,315 (46.5)	0.003
Body mass index (kg/m ²)	28.8±6.6	29.1±7.0	0.14
Diabetes mellitus	2,074 (72.0)	2,080 (73.5)	0.22
Hypertension	2,757 (95.7)	2,755 (97.3)	0.001
Cardiovascular disease ^a	1,528 (53.1)	1,404 (49.6)	0.009
Congestive heart failure	1,823 (63.3)	1,739 (61.4)	0.14
Peripheral vascular disease	1,341 (46.6)	1,229 (43.4)	0.017
Lung disease	435 (15.1)	424 (15.0)	0.89
Peptic ulcer disease	265 (9.2)	251 (8.9)	0.66
Liver Disease	1,529 (53.1)	1,371 (48.4)	<0.001
Malignancy	843 (29.3)	789 (27.9)	0.24
HIV/AIDS	41 (1.4)	40 (1.4)	0.97
Charlson Comorbidity Index	5 [4, 7]	5 [4, 7]	0.010
Cumulative length of hospitalization (days)	25 [10, 53]	23 [9, 50]	0.46
Vascular access type (catheter)	2,290 (79.5)	2,086 (73.7)	<0.001
Medications			
ESAs	1,421 (49.3)	1,311 (46.3)	0.022
Iron	1,457 (50.6)	1,482 (52.4)	0.18
Vitamin D analogs	919 (31.9)	962 (34.0)	0.096
ACEIs/ARBs	1,520 (52.8)	1,510 (53.3)	0.67
Antiplatelets	1,580 (54.9)	1,506 (53.2)	0.21
Warfarin	422 (14.7)	332 (11.7)	0.001
Laboratory parameters			
Serum Albumin (g/dL) ^b	3.2±0.6	3.2±0.6	0.029
eGFR (mL/min/1.73m ²) ^b	14.7 [11.0, 20.9]	14.1 [10.6, 19.5]	0.051
Serum ferritin (ng/mL) ^b	208 [108, 401]	217 [109, 389]	0.070

Absolute Hb (g/dL)	11.0±1.8	10.9±1.8	0.21
Change in Hb (g/dL/month)	-0.23 [-0.55, 0.06]	-0.22 [-0.55, 0.05]	0.98
Number of Hb measurements	10 [5, 19]	9 [5, 18]	0.027

Data are presented as number (percentage), mean ± standard deviation, or median [interquartile interval].

^aCardiovascular disease include coronary artery disease, angina, myocardial infarction, or cerebrovascular disease.

^bLaboratory results averaged over the six-month prelude period.

Abbreviations: ACEI, angiotensin-converting enzyme inhibitor; AIDS, acquired immunodeficiency syndrome; ARB, angiotensin receptor blocker; eGFR, estimated glomerular filtration rate; ESA, erythropoietin stimulating agent; Hb, hemoglobin; HIV, human immunodeficiency virus

Supplementary Table 2. Adjusted hazard ratios (95% CI) for (A) all-cause, (B) cardiovascular, and (C) infection-related mortality after dialysis initiation by quartiles of prelude Hb variability with further adjustment for serum ferritin levels

	Quartile of prelude Hb variability				<i>P</i> for trend ^a
	Q1 (lowest) <0.46	Q2 0.46-<0.69	Q3 0.69-<0.96	Q4 (lowest) ≥0.96	
(A) All-cause					
HRs (95% CI)	1 [reference]	0.92 (0.84–1.01)	1.04 (0.94–1.14)	1.06 (0.97–1.17)	0.026
(B) Cardiovascular					
HRs (95% CI)	1 [reference]	0.84 (0.70–1.02)	1.02 (0.85–1.23)	0.88 (0.73–1.07)	0.51
(C) Infection-related					
HRs (95% CI)	1 [reference]	1.06 (0.72–1.57)	1.13 (0.77–1.65)	1.51 (1.05–2.19)	0.010

Model is adjusted for the variables in model 3 (age, sex, race/ethnicity, marital status, comorbidities [diabetes mellitus, cardiovascular disease, congestive heart failure, peripheral vascular disease, lung disease, peptic ulcer disease, liver disease, malignancy, and HIV/AIDS], Charlson comorbidity index, cumulative length of hospitalization, medications [ESAs, intravenous or oral iron, vitamin D analogs, ACEIs/ARBs, antiplatelets, and warfarin], eGFR levels averaged over the six-month prelude period, type of vascular access [arteriovenous fistula, arteriovenous graft, or catheter], Hb variability parameters [absolute Hb level and change in Hb], and number of Hb measurements during the six-month prelude period) plus serum ferritin levels averaged over the six-month prelude period.

^aLinear trend across the quartiles using the median Hb variability value of each quartile.

Abbreviations: ACEI, angiotensin-converting enzyme inhibitor; AIDS, acquired immunodeficiency syndrome; ARB, angiotensin receptor blocker; eGFR, estimated glomerular filtration rate; ESA, erythropoietin stimulating agent; Hb, hemoglobin; HIV, human immunodeficiency virus

Supplementary Table 3. Adjusted hazard ratios (95% CI) for (A) all-cause, (B) cardiovascular, and (C) infection-related mortality after dialysis initiation by quartiles of prelude inpatient Hb variability ($n = 6,805$)^a

	Quartile of prelude Hb variability				<i>P</i> for trend ^b
	Q1 (lowest) <0.42	Q2 0.42-<0.65	Q3 0.65-<0.92	Q4 (lowest) ≥0.92	
(A) All-cause HRs (95% CI)	1 [reference]	1.02 (0.92–1.12)	1.04 (0.94–1.15)	1.12 (1.01–1.24)	0.020
(B) Cardiovascular HRs (95% CI)	1 [reference]	0.98 (0.81–1.19)	1.03 (0.85–1.25)	1.06 (0.87–1.29)	0.49
(C) Infection-related HRs (95% CI)	1 [reference]	0.94 (0.64–1.38)	0.86 (0.58–1.28)	1.43 (0.99–2.07)	0.023

Model is adjusted for the variables in model 3 (age, sex, race/ethnicity, marital status, comorbidities [diabetes mellitus, cardiovascular disease, congestive heart failure, peripheral vascular disease, lung disease, peptic ulcer disease, liver disease, malignancy, and HIV/AIDS], Charlson comorbidity index, cumulative length of hospitalization, medications [ESAs, intravenous or oral iron, vitamin D analogs, ACEIs/ARBs, antiplatelets, and warfarin], eGFR levels averaged over the six-month prelude period, type of vascular access [arteriovenous fistula, arteriovenous graft, or catheter], Hb variability parameters [absolute Hb level and change in Hb], and number of Hb measurements during the six-month prelude period).

^aUsing at least three inpatient Hb values to calculate the variability.

^bLinear trend across the quartiles using the median Hb variability value of each quartile.

Abbreviations: ACEI, angiotensin-converting enzyme inhibitor; AIDS, acquired immunodeficiency syndrome; ARB, angiotensin receptor blocker; eGFR, estimated glomerular filtration rate; ESA, erythropoietin stimulating agent; Hb, hemoglobin; HIV, human immunodeficiency virus

Supplementary Table 4. Adjusted hazard ratios (95% CI) for (A) all-cause, (B) cardiovascular, and (C) infection-related mortality after dialysis initiation by quartiles of prelude outpatient Hb variability ($n = 8,841$)^a

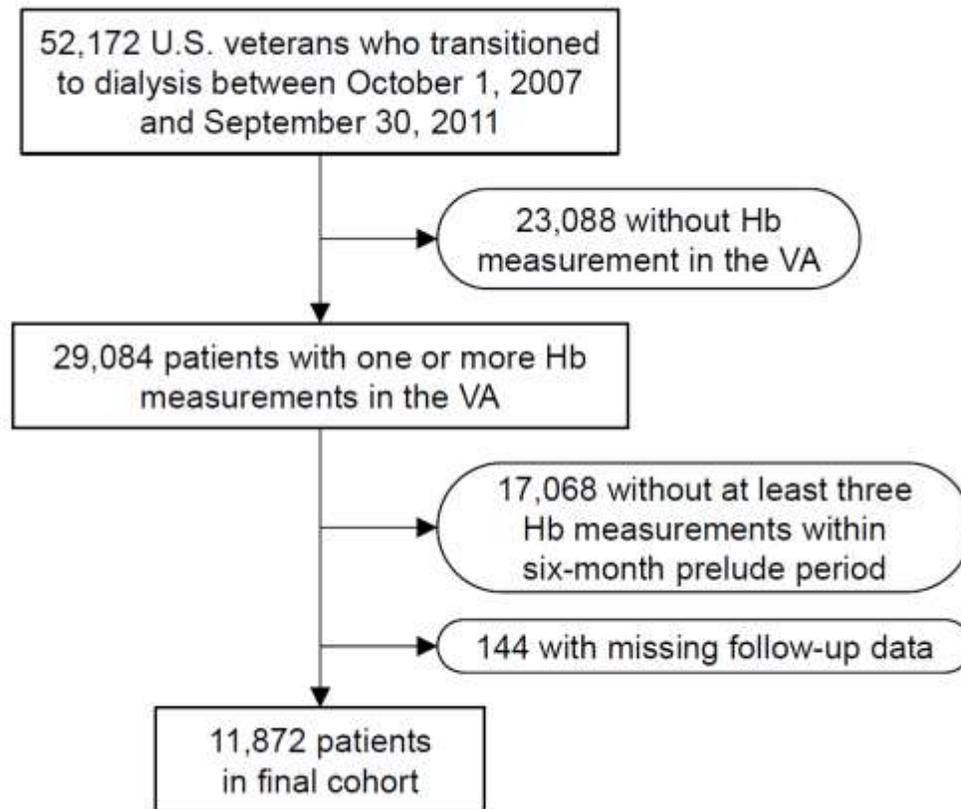
	Quartile of prelude Hb variability				<i>P</i> for trend ^b
	Q1 (lowest) <0.34	Q2 0.34-<0.55	Q3 0.55-<0.83	Q4 (lowest) ≥0.83	
(A) All-cause					
HRs (95% CI)	1 [reference]	0.89 (0.81–0.98)	1.02 (0.93–1.12)	1.06 (0.97–1.16)	0.024
(B) Cardiovascular					
HRs (95% CI)	1 [reference]	1.00 (0.83–1.20)	1.08 (0.90–1.30)	0.99 (0.82–1.19)	0.96
(C) Infection-related					
HRs (95% CI)	1 [reference]	1.00 (0.69–1.47)	1.09 (0.74–1.59)	1.43 (1.00–2.05)	0.024

Model is adjusted for the variables in model 3 (age, sex, race/ethnicity, marital status, comorbidities [diabetes mellitus, cardiovascular disease, congestive heart failure, peripheral vascular disease, lung disease, peptic ulcer disease, liver disease, malignancy, and HIV/AIDS], Charlson comorbidity index, cumulative length of hospitalization, medications [ESAs, intravenous or oral iron, vitamin D analogs, ACEIs/ARBs, antiplatelets, and warfarin], eGFR levels averaged over the six-month prelude period, type of vascular access [arteriovenous fistula, arteriovenous graft, or catheter], Hb variability parameters [absolute Hb level and change in Hb], and number of Hb measurements during the six-month prelude period).

^aUsing at least three outpatient Hb values to calculate the variability.

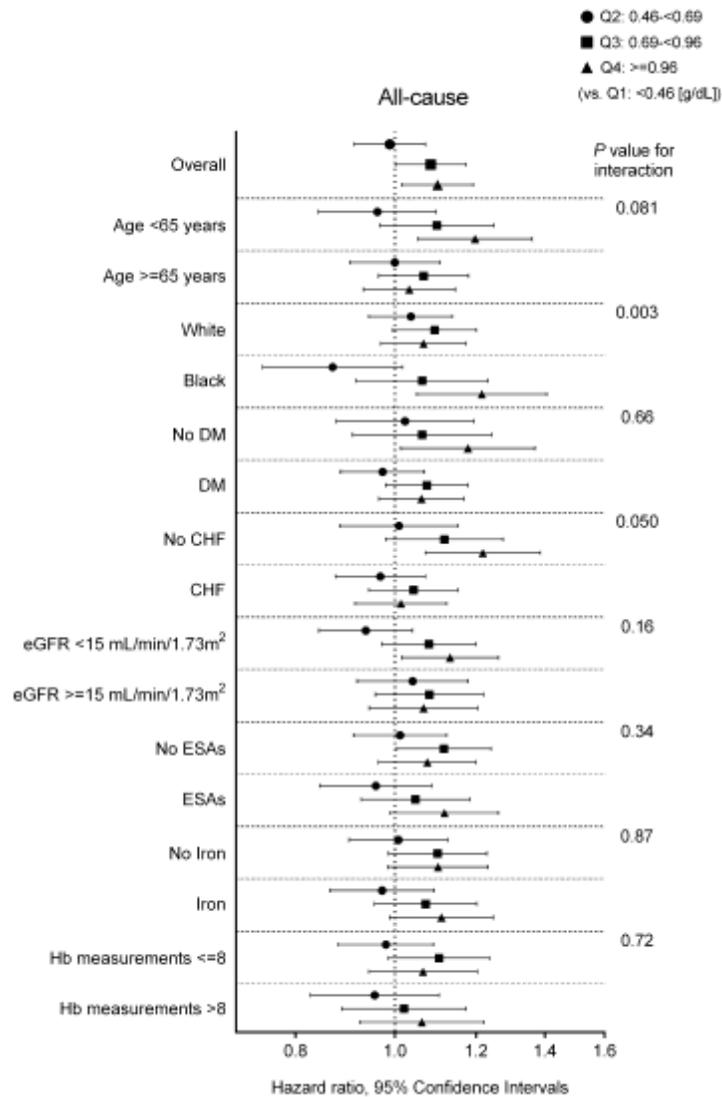
^bLinear trend across the quartiles using the median Hb variability value of each quartile.

Abbreviations: ACEI, angiotensin-converting enzyme inhibitor; AIDS, acquired immunodeficiency syndrome; ARB, angiotensin receptor blocker; eGFR, estimated glomerular filtration rate; ESA, erythropoietin stimulating agent; Hb, hemoglobin; HIV, human immunodeficiency virus

Supplementary Figure 1. Flow chart of the study population

Abbreviations: Hb, hemoglobin; VA, Veterans Affairs

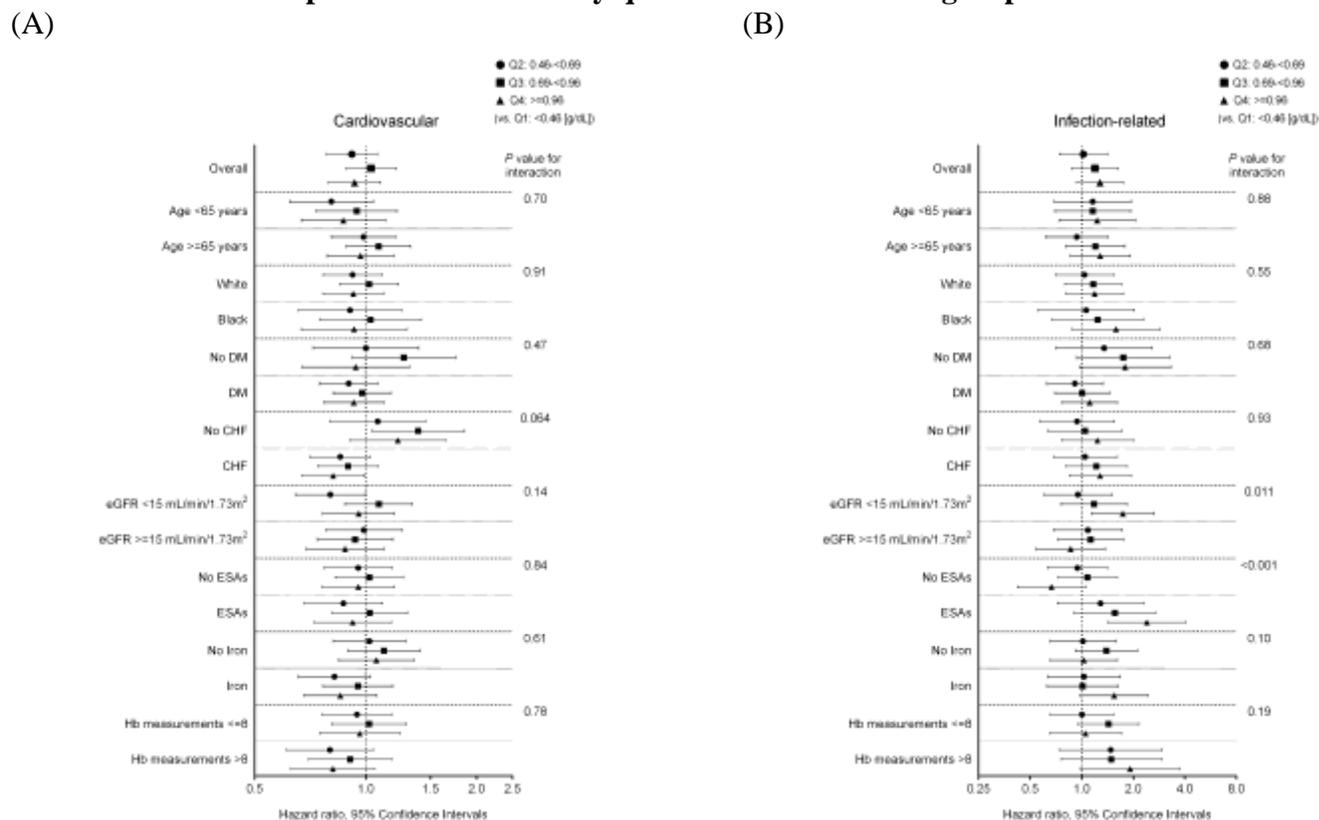
Supplementary Figure 2. Adjusted hazard ratios (95% CIs) of all-cause mortality after dialysis initiation associated with prelude Hb variability quartiles in selected subgroups



Model is adjusted for age, sex, race/ethnicity, marital status, comorbidities (diabetes mellitus, cardiovascular disease, congestive heart failure, peripheral vascular disease, lung disease, peptic ulcer disease, liver disease, malignancy, and HIV/AIDS), Charlson comorbidity index, cumulative length of hospitalization, medications (ESAs, intravenous or oral iron, vitamin D analogs, ACEIs/ARBs, antiplatelets, and warfarin), eGFR levels averaged over the six-month prelude period, type of vascular access (arteriovenous fistula, arteriovenous graft, or catheter), Hb variability parameters (absolute Hb level and change in Hb), and number of Hb measurements during the six-month prelude period.

Abbreviations: ACEI, angiotensin-converting enzyme inhibitor; AIDS, acquired immunodeficiency syndrome; ARB, angiotensin receptor blocker; eGFR, estimated glomerular filtration rate; ESA, erythropoietin stimulating agent; Hb, hemoglobin; HIV, human immunodeficiency virus

Supplementary Figure 3. Adjusted hazard ratios (95% CIs) of (A) cardiovascular and (B) infection-related mortality after dialysis initiation associated with prelude Hb variability quartiles in selected subgroup



Model is adjusted for age, sex, race/ethnicity, marital status, comorbidities (diabetes mellitus, cardiovascular disease, congestive heart failure, peripheral vascular disease, lung disease, peptic ulcer disease, liver disease, malignancy, and HIV/AIDS), Charlson comorbidity index, cumulative length of hospitalization, medications (ESAs, intravenous or oral iron, vitamin D analogs, ACEIs/ARBs, antiplatelets, and warfarin), eGFR levels averaged over the six-month prelude period, type of vascular access (arteriovenous fistula, arteriovenous graft, or catheter), Hb variability parameters (absolute Hb level and change in Hb), and number of Hb measurements during the six-month prelude period.

Abbreviations: ACEI, angiotensin-converting enzyme inhibitor; AIDS, acquired immunodeficiency syndrome; ARB, angiotensin receptor blocker; eGFR, estimated glomerular filtration rate; ESA, erythropoietin stimulating agent; Hb, hemoglobin; HIV, human immunodeficiency virus