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## Appendix-Text, Table and Figures

### Appendix-Text S1. Calculation of CL<sub>urea</sub>, Total body water and nPCR<sub>dial+renal</sub>

#### 1. CL<sub>urea</sub>

$$CL_{urea} \text{ (mL/min)} = \frac{\text{urinary urea (mg/dL)} \times \text{urinary volume (mL)}}{\text{collected time (min)} \times [0.9 \times \text{serum urea (mg/dL)}]}$$

#### 2. Correction equation for BUN (C<sub>0</sub>) in nPCR<sub>dial+renal</sub>

A. For patients who received hemodialysis three times in the preceding week of the spKt/V measurement:

$$C_0 = BUN \times \{1 + (0.70 + 3.08/(spKt/V)) \times CL_{urea} / TBW\}$$

B. For patients who received hemodialysis two times in the preceding week of the spKt/V measurement:

$$C_0 = BUN \times \{1 + (1.15 + 4.56/(spKt/V)) \times CL_{urea} / TBW\}$$

#### 3. Total body water (TBW)

For male;

$$TBW = 2.447 - (0.09156 \times Age) + (10.74 \times Height \text{ in meters}) + (0.3362 \times Postdialysis Weight)$$

For female;

$$TBW = -2.097 + (10.69 \times Height \text{ in meters}) + (0.2466 \times Postdialysis Weight)$$

#### 4. nPCR<sub>dial+renal</sub>

##### A. For patients who received hemodialysis three times in the preceding week of the spKt/V measurement:

For those measurements at beginning of week (M or T);

$$\text{Calculated nPCR} = \frac{C_0}{\{36.3 + 5.48 \times (spKt/V) + 53.5/(spKt/V)\}} + 0.168$$

For those measurements at midweek (W or Th);

$$\text{Calculated nPCR} = \frac{C_0}{\{25.8 + 1.15 \times (spKt/V) + 56.4/(spKt/V)\}} + 0.168$$

For those measurements at end-of-week (F or Sa);

$$\text{Calculated nPCR} = \frac{C_0}{\{16.3 + 4.30 \times (spKt/V) + 56.6/(spKt/V)\}} + 0.168$$

##### B. For patients who received hemodialysis two times in the preceding week of the spKt/V measurement:

For those measurements at beginning of week (M or T or W);

$$\text{Calculated nPCR} = \frac{C_0}{\{48.0 + 5.14 \times (spKt/V) + 79.0/(spKt/V)\}} + 0.168$$

For those measurements at end-of-week (Th or F or Sa);

$$\text{Calculated nPCR} = \frac{C_0}{\{33.0 + 3.60 \times (spKt/V) + 83.2/(spKt/V)\}} + 0.168$$

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**Appendix-Table S1. The baseline characteristics between included (with nPCR<sub>dial+renal</sub> data) and excluded (without nPCR<sub>dial+renal</sub> data) patients of this study in 105,362 incident patients**

Variable	Included patients (n=36,757)	Excluded patients (n=68,605)	StdDiff.
Age (years)	62 ± 15	63 ± 15	0.08
Women (%)	37	47	0.21
<i>Race / ethnicity (%)</i>			
Non-Hispanic white	54	43	0.22
African-American	28	33	0.12
Hispanic	11	17	0.17
Asian	3	3	0.02
<i>ESRD Reason (%)</i>			
Diabetes	47	46	0.02
Hypertension	28	30	0.04
Glomerulonephritis	10	9	0.03
Cystic Kidney Disease	2	1	0.04
Others	13	14	0.02
<i>Access type (%)</i>			
Central Venous Catheter	74	76	0.05
AV Fistula	18	14	0.12
AV Graft	4	4	0.03
<i>Comorbidity (%)</i>			
Hypertension	50	52	0.03
Congestive Heart Failure	38	36	0.04
Cerebrovascular disease	2	2	0.02
History of Cancer	2	2	0.01
spKt/V	1.55 ± 0.36	1.42 ± 0.29	0.39

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Body Mass Index (kg/m <sup>2</sup> )	27.4 (23.6, 32.7)	26.3 (22.7, 31.2)	0.18
<i>Laboratories</i>			
Hemoglobin (g/dL)	11.2 ± 1.1	11.1 ± 1.2	0.18
Albumin (g/dL)	3.57 ± 0.46	3.48 ± 0.48	0.19
Corrected Calcium (mg/dL)	9.1 ± 0.5	9.1 ± 0.6	0.07
Phosphorus (mg/dL)	5.0 ± 1.1	4.9 ± 1.1	0.09
Creatinine (mg/dL)	5.9 ± 2.4	5.9 ± 2.4	0.00
Ferritin (ng/mL)	268 (157, 451)	289 (168, 496)	0.09
Bicarbonate (mEq/L)	23.5 ± 2.6	23.7 ± 2.7	0.07

*Note:* continuous values are expressed as mean ±SD if normally distributed or median (interquartile range) if skewed. Differences in patient characteristics between two groups were compared by Std Diff, of which 0.8, 0.5, and 0.2 were considered large, medium, and small differences, respectively, and ≥0.1 was defined as meaningful imbalance.

Abbreviations: AV Fistula, arteriovenous fistula; AV Graft, arteriovenous graft; spKt/V, single pool Kt/V; Std Diff, standardized difference.

**Appendix-Table S2. Association between baseline nPCR<sub>dial+renal</sub> and five-year mortality in 36,757 incident patients**

All-cause mortality	Unadjusted		Case-mix adjusted		Case-mix and MICS adjusted	
Baseline nPCR <sub>dial+renal</sub> (g/kg/day)	Hazard Ratio (95% confidence interval)	<i>P</i> value	Hazard Ratio (95% confidence interval)	<i>P</i> value	Hazard Ratio (95% confidence interval)	<i>P</i> value
< 0.6	1.54 (1.41-1.68)	<0.001	1.57 (1.43-1.71)	<0.001	1.25 (1.14-1.37)	<0.001
0.6 ≤ and < 0.7	1.30 (1.20-1.42)	<0.001	1.27 (1.16-1.38)	<0.001	1.14 (1.05-1.24)	0.002
0.7 ≤ and < 0.8	1.12 (1.03-1.21)	0.005	1.11 (1.03-1.21)	0.006	1.03 (0.95-1.11)	0.48
0.8 ≤ and < 0.9	1.00	NA	1.00	NA	1.00	NA
0.9 ≤ and < 1.0	0.92 (0.85-0.99)	0.03	0.92 (0.85-1.00)	0.047	0.94 (0.87-1.02)	0.13
1.0 ≤ and < 1.1	0.91 (0.83-0.98)	0.02	0.90 (0.83-0.98)	0.01	0.94 (0.86-1.02)	0.13
1.1 ≤ and < 1.2	0.82 (0.75-0.90)	<0.001	0.85 (0.78-0.93)	<0.001	0.89 (0.81-0.98)	0.02
1.2 ≤ and < 1.3	0.75 (0.67-0.83)	<0.001	0.78 (0.70-0.86)	<0.001	0.81 (0.73-0.90)	<0.001
1.3 ≤ and < 1.4	0.73 (0.65-0.83)	<0.001	0.75 (0.66-0.85)	<0.001	0.79 (0.69-0.89)	<0.001
≥1.4	0.73 (0.66-0.81)	<0.001	0.80 (0.72-0.89)	<0.001	0.83 (0.75-0.92)	0.001

Abbreviations: nPCR, normalized protein catabolic rate; MICS, malnutrition-inflammation cachexia syndrome

**Appendix-Table S3. Association between Change in nPCR<sub>dial+renal</sub> during first six months and Serum albumin level at PQ3  $\geq 3.8$  g/dL in 13,882 incident patients**

Likelihood of Serum Alb $\geq 3.8$ at PQ3	Baseline nPCR <sub>dial+renal</sub> and Baseline Alb adjusted		Baseline nPCR <sub>dial+renal</sub> , Baseline Alb, and Case-mix adjusted		Baseline nPCR <sub>dial+renal</sub> , Baseline Alb, Case-mix and MICS adjusted	
Change in nPCR <sub>dial+renal</sub> (g/kg/day)	Odds Ratio (95% confidence interval)	<i>P</i> value	Odds Ratio (95% confidence interval)	<i>P</i> value	Odds Ratio (95% confidence interval)	<i>P</i> value
< -0.2	0.49 (0.42-0.58)	<0.001	0.48 (0.41-0.57)	<0.001	0.53 (0.44-0.63)	<0.001
-0.2 $\leq$ and < -0.1	0.61 (0.51-0.73)	<0.001	0.59 (0.50-0.71)	<0.001	0.62 (0.51-0.74)	<0.001
-0.1 $\leq$ and < 0	0.75 (0.64-0.88)	<0.001	0.75 (0.64-0.88)	<0.001	0.77 (0.66-0.91)	0.002
0 $\leq$ and < 0.1	0.92 (0.79-1.07)	0.30	0.92 (0.79-1.07)	0.28	0.94 (0.80-1.10)	0.43
0.1 $\leq$ and < 0.2	1.00	NA	1.00	NA	1.00	NA
0.2 $\leq$ and < 0.3	1.27 (1.08-1.48)	0.004	1.27 (1.08-1.49)	0.004	1.26 (1.07-1.48)	0.006
0.3 $\leq$ and < 0.4	1.28 (1.07-1.53)	0.006	1.30 (1.09-1.56)	0.004	1.30 (1.08-1.56)	0.005
0.4 $\leq$ and < 0.5	1.56 (1.27-1.90)	<0.001	1.54 (1.26-1.89)	<0.001	1.55 (1.26-1.90)	<0.001
0.5 $\leq$	1.58 (1.32-1.90)	<0.001	1.59 (1.32-1.92)	<0.001	1.62 (1.35-1.96)	<0.001

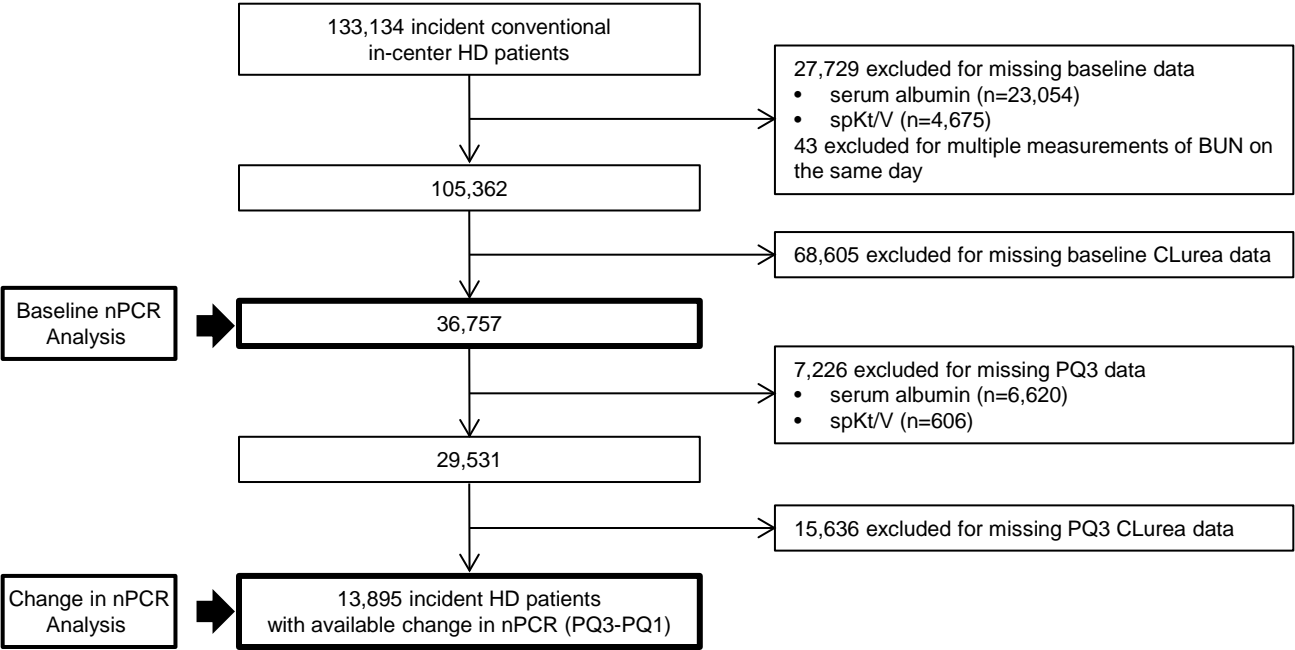
Abbreviations: Alb, albumin; nPCR, normalized protein catabolic rate; MICS, malnutrition-inflammation cachexia syndrome

**Appendix-Table S4. Association between change in nPCR<sub>dial+renal</sub> and 4.5-year mortality in 13,895 incident patients**

All-cause mortality	Baseline nPCR <sub>dial+renal</sub> adjusted		Baseline nPCR <sub>dial+renal</sub> and case-mix adjusted		Baseline nPCR <sub>dial+renal</sub> , case-mix and MICS adjusted	
Change in nPCR <sub>dial+renal</sub> (g/kg/day)	Hazard Ratio (95% confidence interval)	<i>P</i> value	Hazard Ratio (95% confidence interval)	<i>P</i> value	Hazard Ratio (95% confidence interval)	<i>P</i> value
≤ -0.2	1.43 (1.23-1.66)	<0.001	1.47 (1.27-1.71)	<0.001	1.32 (1.14-1.54)	<0.001
> -0.2 and ≤ -0.1	1.22 (1.05-1.42)	0.01	1.29 (1.10-1.50)	0.001	1.22 (1.04-1.42)	0.01
> -0.1 and ≤ 0	1.10 (0.96-1.26)	0.18	1.12 (0.98-1.28)	0.11	1.11 (0.97-1.27)	0.14
> 0 and ≤ 0.1	1.00 (0.88-1.15)	0.98	1.02 (0.89-1.17)	0.75	1.01 (0.88-1.15)	0.91
> 0.1 and ≤ 0.2	1.00	NA	1.00	NA	1.00	NA
> 0.2 and ≤ 0.3	0.93 (0.81-1.07)	0.31	0.93 (0.81-1.08)	0.35	0.89 (0.77-1.02)	0.1
> 0.3 and ≤ 0.4	0.93 (0.80-1.09)	0.40	0.90 (0.77-1.05)	0.20	0.86 (0.74-1.01)	0.07
> 0.4 and ≤ 0.5	0.91 (0.77-1.09)	0.31	0.89 (0.75-1.06)	0.19	0.82 (0.69-0.97)	0.02
0.5 <	0.86 (0.73-1.02)	0.08	0.82 (0.70-0.97)	0.02	0.76 (0.64-0.90)	0.001

Abbreviations: nPCR, normalized protein catabolic rate; MICS, malnutrition-inflammation cachexia syndrome

**Appendix-Figure S1.**





**Appendix-Figure S2.**

