Supplemental Material

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Supplemental Table 1. Distribution of Baseline Characteristics of the Development and Validation Cohorts

	Development Cohort, Northwest, 2002-2008	Validation Cohort, Colorado, 2006-2008
Total N	22,460	16,553
Events*	737	360
Sex		
Men, n (%)	9,082 (40.4)	6,283 (38.0)
Women, n (%)	13,378 (59.6)	10,270 (62.0)
Age		
Mean (SD)	74.61 (10.05)	74.66 (8.95)
30 to 34 years, n (%)	16 (0.1)	3 (0.02)
35 to 39 years, n (%)	47 (0.2)	23 (0.1)
40 to 44 years, n (%)	108 (0.5)	37 (0.2)
45 to 49 years, n (%)	202 (0.9)	126 (0.8)
50 to 54 years, n (%)	482 (2.2)	240 (1.5)
55 to 59 years, n (%)	1,008 (4.5)	721 (4.4)
60 to 64 years, n (%)	1,958 (8.7)	1,153 (7.0)
65 to 69 years, n (%)	2,572 (11.5)	1,699 (10.3)
70 to 74 years, n (%)	3,491 (15.5)	3,169 (19.1)
75 to 79 years, n (%)	4,035 (18.0)	3,992 (24.0)
80 to 84 years, n (%)	4,667 (20.8)	3,358 (20.3)
85 to 89 years, n (%)	3,874 (17.3)	2,032 (12.3)

eGFR		
Mean (SD)	46.76 (10.10)	47.45 (9.79)
59 to 55 mL/min/1.73m^2, n (%)	5,014 (22.3)	4,168 (25.2)
54 to 50 mL/min/1.73m^2, n (%)	4,663 (20.8)	3,974 (24.0)
49 to 45 mL/min/1.73m^2, n (%)	3,745 (16.7)	2,993 (18.1)
44 to 40 mL/min/1.73m^2, n (%)	2,839 (12.6)	2,094 (12.7)
39 to 35 mL/min/1.73m^{2}n (%)	1,990 (8.9)	1,333 (8.1)
34 to 30 mL/min/1.73m^2, n (%)	1,574 (7.0)	888 (5.4)
29 to 25 mL/min/1.73m^2, n (%)	1,032 (4.6)	496 (3.0)
24 to 20 mL/min/1.73m^2, n (%)	762 (3.4)	314 (1.9)
19 to 15 mL/min/1.73m^2, n (%)	841 (3.7)	393 (1.8)
Proteinuria/albuminuria		
Yes, n (%)	5,557 (24.7)	3,826 (23.1)
No, n (%)	11,034 (49.1)	8,318 (50.3)
Missing, n (%)	5,869 (26.1)	4,409 (26.6)
Hemoglobin		
Mean (SD)	12.95 (1.67)	14.07 (1.77)
$\geq$ 15.0 g/dL, n (%)	2,197 (9.8)	4,360 (26.3)
14.9 to 14.0 g/dL, n (%)	3,303 (14.7)	3,282 (19.8)
13.9 to 13.0 g/dL, n (%)	4,647 (20.7)	2,935 (17.7)
12.9 to 12.0 g/dL, n (%)	4,558 (20.3)	1,805 (10.9)
11.9 to 11.0 g/dL, n (%)	3,018 (13.4)	946 (5.7)
10.9 to 10.0 g/dL, n (%)	1,438 (6.4)	427 (2.6)
9.9 to 9.0 g/dL, n (%)	561 (2.5)	195 (1.2)
8.9 to 8.0 g/dL, n (%)	164 (0.7)	41 (0.3)

< 8.0 g/dL, n (%)	65 (0.3)	11 (0.1)
Missing, n (%)	2,513 (11.2)	2551 (15.4)
Diabetes†		
No diabetes, n (%)	14,758 (65.7)	12,090 (73.0)
Diabetes, no complications, n (%)	1,195 (5.3)	929 (5.6)
Diabetes, 1 complications, n (%)	2,030 (9.0)	1,407 (8.5)
Diabetes, 2 complications, n (%)	1,964 (8.7)	1,149 (6.9)
Diabetes, 3 or more complications, n (%)	2,513 (11.2)	978 (5.9)
Diabetes Complications Severity Index among individuals with diabetes, mean (SD)	3.14 (2.4)	1.57 (1.2)
Systolic blood pressure		
Mean (SD)	131.2 (20.1)	129.4 (18.62)
< 120 mm Hg, n (%)	5,625 (25.0)	4,504 (27.2)
120 to 124 mm Hg, n (%)	3,133 (14.0)	2,657 (16.1)
125 to 129 mm Hg, n (%)	1,760 (7.8)	1,347 (8.1)
130 to 134 mm Hg, n (%)	3,047 (13.6)	2,283 (13.8)
134 to 139 mm Hg, n (%)	1,828 (8.1)	1,260 (7.6)
140 to 144 mm Hg, n (%)	2,312 (10.2)	1,597 (9.7)
145 to 149 mm Hg, n (%)	1,014 (4.5)	571 (3.5)

150 to 154 mm Hg, n (%)	1,147 (5.1)	8095 (4.9)
155 to 159 mm Hg, n (%)	602 (2.7)	358 (2.2)
≥ 160 mm Hg, n (%)	1,975 (8.8)	1,125 (6.8)
Missing	17 (0.1)	46 (0.3)
Antihypertensive medication		
Yes, n (%)	19,104 (85.1)	13,563 (81.9)
No, n (%)	3,356 (14.9)	2,990 (18.1)

* Renal replacement therapy events were identified at the Northwest using their clinical registry. Renal replacement therapy events in Colorado were identified through chart review, starting with the diagnosis and procedure codes for dialysis (ICD-9 diagnosis codes 585.6, V45.1, V56, V56.x, V58.8 (excluding V58.81); ICD-9 procedure codes 39.93, 54.98; and CPT codes 90921, 90925, 90935-90999) and renal transplant (ICD-9 diagnosis codes: V42.0, 996.81; ICD-9 procedure codes 55.6, 55.61, 55.69; CPT codes 50360, 50365, 50380). We required that individuals be receiving chronic outpatient dialysis (for greater than 90 days) to be included as a dialysis case.

† We identified diabetes using ICD-9 diagnosis codes. The Diabetes Complications Severity Index was only calculated for those with diabetes, and is based on ICD-9 codes, and counts the following complications: retinopathy, nephropathy, neuropathy, cerebrovascular disease, cardiovascular disease, peripheral vascular disease, and metabolic complications such as diabetic ketoacidosis. We excluded nephropathy from our index, because we measured that with laboratory tests; consequently, our adaptation of the index has a potential range of 0 to 6 complications (19).

Supplemental Table 2. Positive Predictive Value, Sensitivity, and Specificity by Predicted Risk of Renal Replacement Therapy for the KPNW Prediction Model

Predicted Risk of RRT	Risk Score Points	Observed Risk of RRT in Patients Scoring at Least That Many Points: Positive Predictive Value	Sensitivity (%)	Specificity (%)
≥ 1%	70	712/8,258 (8.6%)	96.6	65.3
≥ 5%	95	651/3,653 (17.8%)	88.3	86.2
≥ 10%	106	617/2,616 (23.6%)	83.7	90.8
≥ 15%	113	592/2,124 (27.9%)	80.3	92.9
≥ 20%	117	574/1,830 (31.4%)	77.9	94.2
≥ 25%	121	562/1,618 (34.7%)	76.3	95.1
≥ 30%	125	543/1,445 (37.6%)	73.7	95.8
≥ 35%	127	523/1,313 (39.8%)	71.0	96.4
≥ 40%	130	507/1,198 (42.3%)	68.8	96.8
≥ 45%	132	489/1,099 (44.5%)	66.4	97.2
≥ 50%	135	467/995 (46.9%)	63.4	97.6

Supplemental Figure 1. Applying the KPNW Risk Predictor to an Individual Patient.

The equation describing the five year kidney failure risk predictor is:

$$
\begin{aligned}
\text{P} \quad &= 1 - S_0(t)^{\exp f(x)} \\
&= 1 - S_{ave}(t = 1825)^{\exp f(\overline{x}) - f_0(x)} \\
&= 1 - S_{ave}(t = 1825) ** \exp\{-\mathbf{0.178} * GFR + 0.048 * GFR' - \\
&\mathbf{0.035} * (age - \mathbf{74.61}) + \mathbf{0.003} * (age' - \mathbf{74.61}) - \mathbf{0.126} * \\
&(age'' - \mathbf{74.61}) - \mathbf{0.048} * (age''' - \mathbf{74.61}) + \mathbf{0.164} * \\
&(hgbcat - \mathbf{12.95}) - \mathbf{0.094} * sbpcat + \mathbf{0.116} * diabcomp1 + \\
&\mathbf{0.463} * diabcomp2 + \mathbf{0.508} * diabcomp3 + \mathbf{0.689} * diabcomp4 + \\
&\mathbf{0.712} * male + \mathbf{0.372} * htnmed + \mathbf{0.381} * proteinuria\} \\
&= 0.0472
\end{aligned}
$$

where

$$f(x) = B_1(x_1 - \overline{x}_1) + \cdots B_\rho(x_\rho - \overline{x}_\rho)$$

$$f(x) = (B_1\overline{x}_1 + \cdots B_\rho\overline{x}_\rho) \ldots (B_1x_1 + \cdots B_\rho x_\rho)$$

$S_{ave}(t = 1825)$ is the five-year survival rate for an individual with the average value of covariates in the risk equation $(x_1 \ldots x_\rho)$. $B_1 \ldots B_\rho$ are the regression coefficients. $(B_1\overline{x}_1 + \cdots B_\rho\overline{x}_\rho)$ represent the sum of the average values for the risk factors. $(B_1x_1 + \cdots B_\rho x_\rho)$ represent the sum of the individual's risk factors. GFR', age', age'', and age''' refer to spline basis functions of GFR and age, respectively (26).

Supplemental Figure 2. Cumulative Risk of Renal Replacement Therapy by Quintile of Predicted Risk, KPNW