

Supplementary Material

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Figure S1. Percentages of patients receiving transfusions by risk score

Table S1. ICD-9-CM diagnosis codes used to identify baseline comorbid conditions

Conditions	ICD-9-CM Diagnosis Codes/HCPCS	ICD-9-CM V codes
Comorbid conditions		
ASHD	410-414	V45.81; V45.82
CHF	398.91;422; 425; 428; 402.X1; 404.x1; 404.x3	V42.1
CVA/TIA	430-438	
PVD	440-444; 447; 451-453; 557	
Cardiac (other)	420-421;423-424; 429; 785.0-785.3	V42.2;V43.3
COPD	491-494; 496; 510	
GI bleeding	456.0-456.2; 530.7; 531-534; 569.84; 569.85; 578	
Liver disease	570; 571; 572.1; 572.4; 573.1-573.3	V42.7
Dysrhythmia	426-427	V45.0; V53.3
Cancer	140-172; 174-208; 230-231; 233-234	
Diabetes	250; 357.2; 362.0x; 366.41	
Inflammatory conditions		
Glomerulonephritis	582.9, 582.1, 583.1, 583.2, 583.81, 583.89, 583.4, 580.0, 582.0	
Chronic infections	Osteomyelitis (730.1), endocarditis (424.90), HIV (042), tuberculosis (010-018), systemic fungal infections: (Cryptococcosis [117.5], coccidioidomycosis [114], aspergillosis [117.3], pneumocystis pneumonia [136.3])	
Crohn disease	555	
Ulcerative colitis	556	
Hepatitis C	070.41, 070.44, 070.51, 070.54, 070.70, 070.71	
Gout	274	V77.5
Rheumatoid arthritis	714.0	

ASHD, atherosclerotic heart disease; CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease; CVA/TIA, cerebrovascular accident/transient ischemic attack; GI, gastrointestinal; HCPCS, Healthcare Common Procedure Coding System; ICD-9-CM, International Classification of Diseases, Ninth Revision, Clinical Modification; PVD, peripheral vascular disease.

Table S2. Percentages of patients who received transfusions by risk score

Score group	Transfusion rate (%)
score<=-1.3720000	3.8
-1.3720000 <score<=-1.2386100	3.94
-1.2386100<score<= -1.1129000	5.04
-1.1129000<score<=-1.0242000	5.9
-1.0242000 <score<=-0.9186000	5.98
-0.9186000 <score<=-0.8198000	6.63
-0.8198000 <score<=-0.5483800	8.24
-0.5483800 <score<=-0.3750800	10.91
-0.3750800 <score<=0.2766000	14.83
0.2766000<score	32.75

Table S3. Percentages of patients who received transfusions by risk score

Score group	Transfusion rate (%)
score<=-1.2386100	3.88
-1.2386100<score<=-0.9186000	5.64
-0.9186000 <score<=-0.5483800	7.42
-0.5483800<score<=0.2766000	12.91
0.2766000<score	32.75

Table S4. Percentages of patients who received transfusions by patient characteristics

	N	Percent Transfused
All	31,564	9.8
Age groups		
20-44	4,455	10.2
45-64	13,189	9.4
65-79	10,390	10.2
80+	3,530	9.6
Gender		
Male	15,847	9.7
Female	15,717	9.9
Race		
White	16,093	10.3
Black	13,763	9.4
Other	1,708	8.8
Primary cause of ESRD		
diabetes	14,100	9.6
hypertension	9,234	9.1
glomerulonephritis	3,715	9.7
Other	4,515	12.1
Dialysis vintage		
< 1 year	4,557	11.1
1-<2 years	4,470	9.8
2-<3 years	4,176	9.2
3-<5 years	6,926	9.6
5+ years	11,435	9.7
Dialysis access type		
Catheter	6,547	12.1
Fistula/Graft	25,017	9.2
Total length of hospitalization during 6 months baseline		
0 days	13,896	6.1
1-10 days	8,874	10.1
>10 days	8,794	15.5
Weight (kilogram)		
< 60.9	7,892	9.7
60.9-< 72.4	7,917	9.6
72.4-< 87.5	7,878	10.0
87.5+	7,877	9.9
Comorbid conditions during 6 months baseline		
Diabetes	20,184	10.1
ASHD	12,659	11.9
CHF	12,835	12.5
CVA/TIA	5,052	12.1
PVD	10,888	12.5
Dysrhythmia	8,912	13.2
Cardiac (other)	8,814	13.2
COPD	7,675	13.1
GI	3,596	19.0
Liver disease	2,316	14.9
Cancer	2,686	14.6
Inflammatory conditions during 6 months baseline		
Glomerulonephritis	2,840	13.0
Chronic infections	1,597	12.7
Crohn's disease	147	18.4
Ulcerative colitis	143	18.9
Hepatitis C	1,291	15.3
Gout	2,255	12.5
Rheumatoid arthritis	505	10.7
Hemoglobin (measured by mean value of last 2 months)		
< 8.5	2,398	21.9
>= 8.5 and < 9.5	11,676	11.3
>= 9.5	17,490	7.2
Monthly ESA (measured by mean value of last 2 months)		
<= 42000	10,345	6.4
> 42000 and < 112000	13,028	8.1
>= 112000	8,191	16.8
TSAT		
< 20	6,493	11.6
>= 20 and <= 40	20,203	8.7
> 40	4,868	12.0
Ferritin		
<= 600	7,328	11.7
> 600 and < 1000	11,672	7.8
>= 1000	12,564	10.6
IV iron use in exposure period		
No	6294	11.9
Yes	25270	9.3
IV vitamin D use in exposure period		
No	6132	10.9
Yes	25432	9.6
RBC Transfusion use in exposure period		
No	27645	7.0
Yes	3919	30.0

Table S5. Parameter estimates from a logistic regression using 2012 training data

Variables		Estimate	Standard Error	Chi-Square	<i>P</i>
Intercept		-1.821	0.313	33.896	< 0.0001
Age groups, years					
45-64		-0.116	0.064	3.290	0.0697
65-79		-0.021	0.069	0.093	0.7604
≥ 80		-0.028	0.086	0.106	0.7448
Female		0.077	0.041	3.549	0.0596
Race groups					
Black		-0.096	0.044	4.806	0.0284
Other		-0.001	0.094	0.000	0.9888
Primary cause of ESRD					
Hypertension		0.002	0.057	0.002	0.9684
Glomerulonephritis		-0.018	0.076	0.053	0.8176
Other		0.155	0.067	5.332	0.0209
Fistula/graft		-0.103	0.048	4.690	0.0303
Total length of hospitalization during 6-month baseline, days					
1-10		0.120	0.057	4.407	0.0358
> 10		0.230	0.064	12.840	0.0003
Comorbid and inflammatory conditions					
Diabetes		0.045	0.055	0.675	0.4114
ASHD		0.036	0.048	0.573	0.4489
CHF		0.083	0.048	3.032	0.0816
PVD		0.083	0.045	3.409	0.0649
Dysrhythmia		0.049	0.047	1.061	0.3031
COPD		0.091	0.047	3.768	0.0522
GI bleeding		0.245	0.055	19.770	<.0001
Liver disease		0.120	0.070	2.936	0.0866
Cancer		0.183	0.064	8.225	0.0041
Crohn disease		0.467	0.229	4.135	0.042
Ulcerative colitis		0.441	0.232	3.630	0.0568
Hepatitis C		0.170	0.090	3.565	0.059
Rheumatoid arthritis		-0.274	0.156	3.073	0.0796
Parameters and interactions	Groups				
HB	2	-0.798	0.246	10.516	0.0012
HB	3	-1.268	0.245	26.743	<.0001
ESA	2	-0.063	0.246	0.065	0.7992
ESA	3	0.405	0.230	3.107	0.078
TSAT	2	-0.136	0.193	0.497	0.4808
TSAT	3	0.101	0.243	0.172	0.6783
Ferritin	2	-0.716	0.230	9.707	0.0018
Ferritin	3	-0.131	0.197	0.443	0.5057
IV iron	yes	-0.285	0.228	1.569	0.2103
HB*ESA	2 2	0.050	0.212	0.055	0.8144
HB*ESA	2 3	-0.003	0.193	0.000	0.9877
HB*ESA	3 2	0.572	0.208	7.547	0.006

HB*ESA	3	3	0.393	0.194	4.106	0.0427
ESA*TSAT	2	2	0.008	0.149	0.003	0.9571
ESA*TSAT	2	3	0.001	0.185	0.000	0.9969
ESA*TSAT	3	2	0.215	0.145	2.189	0.139
ESA*TSAT	3	3	0.553	0.179	9.594	0.002
HB*Ferritin	2	2	0.309	0.171	3.272	0.0705
HB*Ferritin	2	3	0.162	0.159	1.039	0.308
HB*Ferritin	3	2	0.239	0.171	1.957	0.1618
HB*Ferritin	3	3	0.176	0.159	1.221	0.2692
TSAT*Ferritin	2	2	0.141	0.122	1.336	0.2478
TSAT*Ferritin	2	3	0.046	0.122	0.140	0.7087
TSAT*Ferritin	3	2	0.381	0.194	3.856	0.0496
TSAT*Ferritin	3	3	0.323	0.183	3.110	0.0778
IV iron*HB	yes	2	0.532	0.153	12.024	0.0005
IV iron*HB	yes	3	0.513	0.158	10.622	0.0011
IV iron*ESA	yes	2	-0.197	0.129	2.339	0.1262
IV iron*ESA	yes	3	-0.176	0.133	1.757	0.1851
IV iron*TSAT	yes	2	-0.005	0.142	0.001	0.973
IV iron*TSAT	yes	3	-0.513	0.162	10.061	0.0015
IV iron*Ferritin	yes	2	0.114	0.173	0.435	0.5094
IV iron*Ferritin	yes	3	-0.196	0.145	1.829	0.1762
Use of vitamin D	yes		-0.058	0.050	1.369	0.2419
Prior transfusion	yes		1.301	0.048	745.500	<.0001

ASHD, atherosclerotic heart disease; CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease; ESA, erythropoiesis-stimulating agent; GI, gastrointestinal; HB, hemoglobin; IV, intravenous; PVD, peripheral vascular disease; TSAT, transferrin saturation.

Table S6. Development cohort (2012) and the validation cohort (2013). Characteristics were similar between the cohorts.

	2012 Cohort		2013 Cohort	
	N	%	N	%
Total patients	31,564	100.0	34,890	100.0
Mean age (SD)	61.73 (14.88)		62.26 (14.95)	
Age group				
20-44	4,455	14.1	4,745	13.6
45-64	13,189	41.8	14,162	40.6
65-79	10,390	32.9	11,762	33.7
80+	3,530	11.2	4,221	12.1
Gender				
Male	15,847	50.2	17,598	50.4
Female	15,717	49.8	17,292	49.6
Race				
White	16,093	51.0	17,851	51.2
Black	13,763	43.6	14,995	43.0
Other	1,708	5.4	2,044	5.9
Primary cause of ESRD				
Diabetes	14,100	44.7	15,597	44.7
Hypertension	9,234	29.3	10,381	29.8
Glomerulonephritis	3,715	11.8	4,026	11.5
Other	4,515	14.3	4,886	14.0
Mean dialysis vintage (SD)	5.04 (4.97)		5.31 (5.00)	
Dialysis vintage				
<1 year	4,557	14.4	3,870	11.1
1-<2 years	4,470	14.2	4,863	13.9
2-<3 years	4,176	13.2	4,635	13.3
3-<5 years	6,926	21.9	7,995	22.9
5+ years	11,435	36.2	13,527	38.8
Dialysis access type				
Catheter	6,547	20.7	7,574	21.7
Fistula/Graft	25,017	79.3	27,316	78.3
Mean days of total hospitalizations (SD) during baseline	9.44 (15.88)		9.14 (15.26)	
Length of total hospitalizations in days during baseline				
0 days	13,896	44.0	15,693	45.0
1-10 days	8,874	28.1	9,602	27.5
>10 days	8,794	27.9	9,595	27.5
Mean weight	76.28 (22.07)		76.65 (22.15)	
Weight (kilogram)				
< 60.9	7,892	25.0	8,728	25.0
60.9 -< 72.4	7,917	25.1	8,727	25.0
72.4 -< 87.5	7,878	25.0	8,731	25.0

87.5+	7,877	25.0	8,704	25.0
Comorbid conditions during 6 months baseline				
Diabetes	20,184	64.0	22,414	64.2
ASHD	12,659	40.1	13,881	39.8
CHF	12,835	40.7	14,269	40.9
CVA/TIA	5,052	16.0	5,652	16.2
PVD	10,888	34.5	12,038	34.5
Dysrhythmia	8,912	28.2	9,910	28.4
Cardiac (other)	8,814	27.9	9,713	27.8
COPD	7,675	24.3	8,697	24.9
GI	3,596	11.4	3,906	11.2
Liver Disease	2,316	7.3	2,683	7.7
Cancer	2,686	8.5	2,807	8.1
Inflammatory conditions during 6-month baseline period				
Glomerulonephritis	2,840	9.0	3,234	9.3
Chronic infections	1,597	5.1	1,774	5.1
Crohn disease	147	0.5	141	0.4
Ulcerative colitis	143	0.5	100	0.3
Hepatitis C	1,291	4.1	1,463	4.2
Gout	2,255	7.1	2,572	7.4
Rheumatoid arthritis	505	1.6	588	1.7

Figure S1. Percentages of patients receiving transfusions by risk score

