

Supplementary Materials

Table S1. Exclusion of extreme small facilities in profiling analysis: (a) Facilities with raw readmission rate (RRR) of exactly 1 (due to having only several patients) and (b) Facilities with less than 10 discharges.

Year	# Facilities before exclusion	(a) # facilities with RRR=1	# Patients in (a) RRR=1 [min, max]	(b) # facilities with < 10 discharges	# Patients in (b) [min, max]	Total facilities in (a) or (b)	# facilities after exclusion
2010	6364	94	[1, 4]	1017	[1, 9]	1018	5346
2011	6750	117	[1, 2]	1168	[1, 8]	1171	5579
2012	6919	107	[1, 2]	1282	[1, 9]	1282	5637
2013	7121	108	[1, 3]	1492	[1, 9]	1493	5628

Table S2. Agency for Healthcare Research and Quality (AHRQ) Clinical Classification System (CCS) procedure/condition category: (A) Planned procedure list, (C) Discharge condition categories considered acute or complications of care, and (C) Condition categories for high risk discharge.

(A) AHRQ Procedure CC : Procedure
45 : Percutaneous transluminal coronary angioplasty (PTCA); 84 : Cholecystectomy and common duct exploration; Condition CCS 45 : Maintenance chemotherapy; 157 : Amputation of lower extremity; 51 : Endarterectomy, vessel of head and neck; 78 : Colorectal resection; 44 : Coronary artery bypass graft (CABG); 152 : Arthroplasty knee; 113 : Transurethral resection of prostate (TURP); 153 : Hip replacement, total and partial; 211 : Therapeutic radiology for cancer treatment; 158 : Spinal fusion; 48 : Insertion, revision, replacement, removal of cardiac pacemaker or cardioverter/defibrillator; 3 : Laminectomy; excision intervertebral disc; 36 : Lobectomy or pneumonectomy; 55 : Peripheral vascular bypass; 43 : Heart valve procedures; 52 : Aortic resection, replacement or anastomosis; 104 : Nephrectomy, partial or complete; 60 : Embolectomy and endarterectomy of lower limbs; 85 : Inguinal and femoral hernia repair; 124 : Hysterectomy, abdominal and vaginal; 167 : Mastectomy; 154 : Arthroplasty other than hip or knee; 74 : Gastrectomy, partial and total; 114 : Open prostatectomy; 119 : Oophorectomy, unilateral and bilateral; 10 : Thyroidectomy, partial or complete; 64 : Bone marrow transplant, 166 : Lumpectomy, quadrantectomy of breast; 105 : Kidney transplant; 176 : Other organ transplantation; ICD-9 94.26, 94.27 : Electroshock therapy
(B) Discharge condition categories considered acute or complications of care
100 : Acute myocardial infarction; 237 : Complication of device; implant or graft; 106 : Cardiac dysrhythmias; 108 : Congestive heart failure, non-hypertensive; 105 : Conduction disorders; 146 : Diverticulosis and diverticulitis; 2 : Septicemia (except in labor); 238 : Complications of surgical procedures or medical care; 116 : Aortic and peripheral arterial embolism or thrombosis; (207, 225, 226, 227, 229, 230, 231, 232) : Fracture; 145 : Intestinal obstruction without hernia; 201 : Infective arthritis and osteomyelitis (except that caused by TB or sexually transmitted disease); 109 : Acute cerebrovascular disease; 97 : Peri-, endo-, and myocarditis; cardiomyopathy; 122 : Pneumonia (except that caused by TB or sexually transmitted disease); 245 : Syncope; 127 : Chronic obstructive pulmonary disease and bronchiectasis; 131 : Respiratory failure, insufficiency, arrest (adult); 55 : Fluid and electrolyte disorders; 159 : Urinary tract infections; 130 : Pleurisy, pneumothorax, pulmonary collapse; 157 : Acute and unspecified renal failure; 139 : Gastroduodenal ulcer (except hemorrhage); 153 : Gastrointestinal hemorrhage; 160 : Calculus of urinary tract; 112 : Transient cerebral ischemia
(C) Condition categories for high risk discharge
5 : HIV infection; 6 : Hepatitis; 56 : Cystic fibrosis; 57 : Immunity disorders; 61 : Sickle cell anemia; 190 : Fetal distress and abnormal forces of labor; 151 : Other liver diseases; 182 : Hemorrhage during pregnancy, abruptio placenta, placenta previa; 186 : Diabetes or abnormal glucose tolerance complicating pregnancy, childbirth, or the puerperium; 210 : Systemic lupus erythematosus and connective tissue disorders; 243 : Poisoning by nonmedicinal substances

Table S3. Patient risk factor prevalence: percent (number) in years 2010 to 2013.

Risk factor	2010	2011	2012	2013
Age at hospitalization (years)				
<25	1.71 (5,392)	1.56 (4,981)	1.49 (4,609)	1.49 (3,998)
25-45	14.68 (46,300)	14.04 (44,755)	14.11 (43,720)	14.23 (38,306)
45-60	27.42 (86,473)	26.59 (84,737)	26.95 (83,512)	27.05 (72,819)
60-75	34.99 (110,373)	35.73 (113,885)	35.75 (110,786)	35.96 (96,792)
>75	21.2 (66,880)	22.07 (70,350)	21.71 (67,270)	21.27 (57,262)
Sex: Female	48.18 (151,983)	48.42 (154,319)	48.37 (149,899)	48.02 (129,270)
BMI				
Underweight	3.9 (12,314)	3.71 (11,812)	3.68 (11,395)	3.63 (9,783)
Normal weight	29.9 (94,319)	29.16 (92,922)	28.46 (88,183)	28.26 (76,068)
Overweight	28.2 (88,963)	28.04 (89,357)	27.96 (86,652)	27.82 (74,876)
Obese	37.99 (119,822)	39.1 (124,617)	39.91 (123,667)	40.29 (108,450)
Cause of ESRD: Diabetes	36.64 (115,574)	39.86 (127,038)	41.56 (128,804)	42.66 (114,823)
Length of index hospitalization (days)				
<5	48.22 (152,101)	47.61 (151,738)	47.30 (146,594)	47.07 (126,697)
5	12.17 (38,380)	12.35 (39,361)	12.66 (39,223)	12.85 (34,586)
6	9.05 (28,539)	9.12 (29,060)	9.28 (28,760)	9.43 (25,387)
>6	30.56 (96,398)	30.92 (98,549)	30.76 (95,320)	30.65 (82,507)
Time on ESRD (years)				
<1	23.13 (72,971)	25.87 (82,438)	24.75 (76,703)	23.69 (63,768)
1 to 2	15.86 (50,026)	15.54 (49,512)	15.04 (46,619)	14.76 (39,730)
2 to 3	12.63 (39,843)	12.39 (39,481)	12.49 (38,715)	12.22 (32,896)
3 to 6	25.46 (80,306)	24.75 (78,894)	24.53 (76,031)	24.81 (66,772)
>6	22.91 (72,272)	21.46 (68,383)	23.18 (71,829)	24.52 (66,011)
High-risk index hospitalization	1.16 (3,648)	1.06 (3,377)	1.05 (3,269)	1.1 (2,950)
Past-year comorbidities				
Amputation status	5.71 (18,007)	6.57 (20,928)	7.92 (24,553)	8.13 (21,877)
Chronic obstructive pulmonary disease	23.3	24.03	25.46	25.54

(COPD)	(73,502)	(76,601)	(78,903)	(68,737)
Cardiorespiratory failure/shock	17.31	18.6	20.18	21.54
Coagulation defects & other specified hematological disorders	(54,613)	(59,288)	(62,528)	(57,986)
Drug and alcohol disorders	11.8	13.45	15.25	15.63
End-stage liver disease	(37,208)	(42,857)	(47,254)	(42,068)
Fibrosis of lung or other chronic lung disorders	4.03	4.4	5.07	5.17
Hemiplegia/ paraplegia/ paralysis functional disability	(12,723)	(14,014)	(15,708)	(13,911)
Hip fracture/dislocation	3.88	4.22	4.62	4.88
Transplants	(12,252)	(13,458)	(14,328)	(13,131)
Metastatic cancer/acute leukemia	3.05	2.79	2.8	2.69
Severe hematological disorders	(9,618)	(8,883)	(8,687)	(7,245)
Other infectious disease & pneumonias	5.05	4.19	4.24	4.14
Other cancers	(15,920)	(13,352)	(13,147)	(11,147)
Pancreatic disease	1.89	1.48	1.5	1.45
Psychiatric comorbidity	(5,951)	(4,715)	(4,662)	(3,908)
Respirator dependence/tracheostomy status	2.26	1.9	2.01	2.1 (5,665)
Rheumatoid arthritis and inflammatory connective tissue disease	(7,139)	(6,048)	(6,223)	1.02
Seizure disorders and convulsions	1.18	1.04	1.07	(2,750)
Septicemia/shock	5.04	5.1	2.54	1.54
Severe cancer	(15,891)	(16,264)	(7,863)	(4,133)
Severe infection	41.13	38.77	40.34	40.87
Decubitus ulcer or chronic skin ulcer	(129,732)	(123,579)	(125,024)	(110,022)
	7.27	5.32	6.17	6.15
	(22,939)	(16,963)	(19,119)	(16,556)
	5.86	5.07	5.24	5.41
	(18,476)	(16,154)	(16,239)	(14,552)
	21.47	24.03	28.42	29.12
	(67,730)	(76,590)	(88,076)	(78,379)
	0.71	0.77	0.83	0.83
	(2,240)	(2,456)	(2,581)	(2,221)
	5.51	5.4	5.7	5.73
	(17,364)	(17,215)	(17,674)	(15,426)
	8.55	8.3	8.93	8.98
	(26,982)	(26,442)	(27,664)	(24,185)
	17.37	16.67	16.61	16.57
	(54,799)	(53,129)	(51,468)	(44,595)
	3.07	2.75	2.84	2.85
	(9,691)	(8,760)	(8,792)	(7,667)
	5.46	5.1	5.16	5.08
	(17,225)	(16,264)	(16,003)	(13,662)
	14.03	12.26	13.16	12.92
	(44,266)	(39,066)	(40,778)	(34,768)

Table S4. Number of patients, dialysis facilities, discharging hospitals, and readmission characteristics for each year (2010-2013).

Characteristics	2010	2011	2012	2013*
Patients	146,295	146,804	148,128	135,795
Dialysis facilities	5,346	5,579	5,637	5,628
Hospitals	5,223	4,433	4,388	4,254
Index discharges	315,418	318,708	309,897	269,177
Readmissions	93,668	94,226	90,670	76,338
Unplanned readmission rate	29.7%	29.6%	29.3%	28.4%

* For the year 2013, only the first 11 months (January 1-November 30) of data for index discharges were used to allow for a 30-day follow up period needed to assess 30-day readmissions; thus, accounting for the smaller overall numbers of patients and discharges in the 2013 cohort.

Table S5. Flagging of dialysis facilities with significantly worse or non-significant risk-adjusted standardized readmission ratio (SRR) for random effects (RE) model and fixed effects models 1 and 2 (FE1, FE2) for the 2010 cohort. Highlighted are the number of facilities (N_F) flagged as significantly worse or better by at least two models and with $N_F = 5,043$ facilities flagged as non-significant by all 3 models.

RE	Models		Num. Facilities	Percent
	FE1	FE2		
Non-significant	Non-significant	Non-significant	$N_F = 5043$	94.33%
Non-significant	Non-significant	Significantly worse	7	0.13%
Non-significant	Significantly worse	Non-significant	4	0.07%
Non-significant	Significantly worse	Significantly worse	34	0.64%
Significantly worse	Non-significant	Non-significant	68	1.27%
Significantly worse	Non-significant	Significantly worse	14	0.26%
Significantly worse	Significantly worse	Non-significant	20	0.37%
Significantly worse	Significantly worse	Significantly worse	75	1.40%
			Total $N_F = 222$	

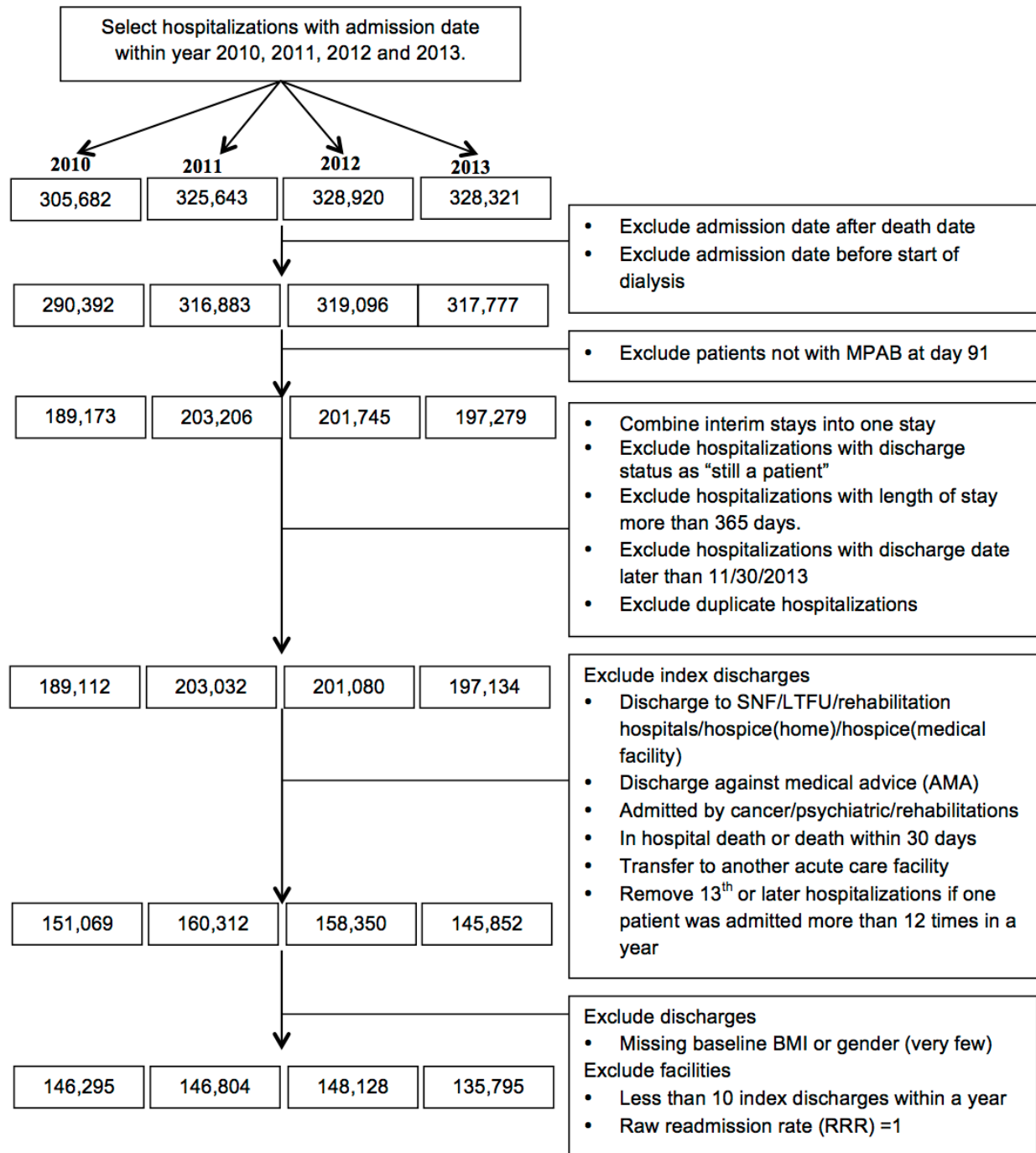
Suppl. Fig 1. Construction of annual (year 2010-2013) study cohorts (number of patients) and inclusion/exclusion for 30-day readmission profiling analysis.

Suppl. Fig 2. Trends in adjusted odds ratio and 95% confidence intervals (length of horizontal lines) for patient risk factors in year 2011 (from model FE2): (A) past-year morbidities and (B) demographic variables, diabetes as the cause of ESRD, years on ESRD, high risk index discharge, and length of index hospitalization.

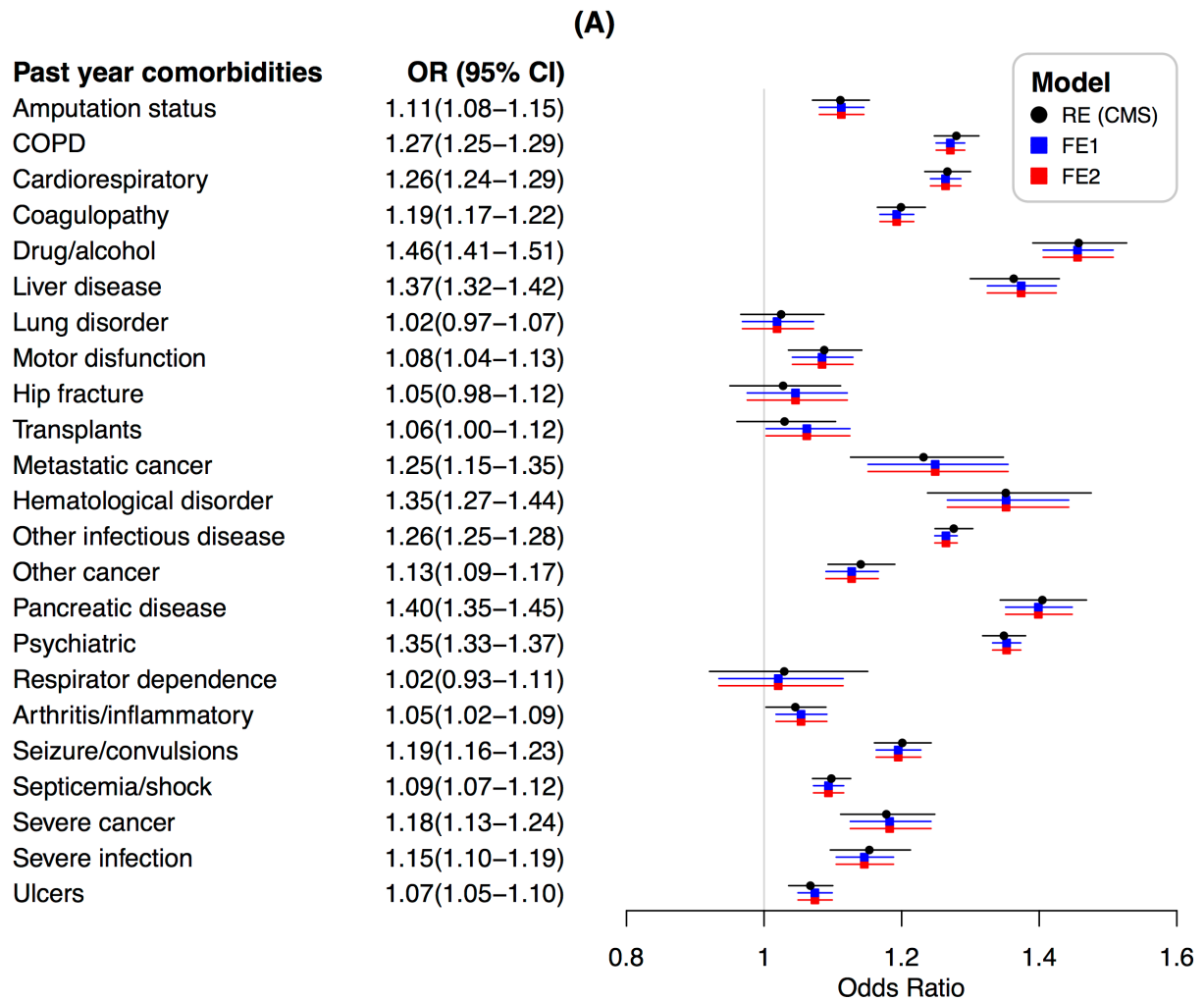
Suppl. Fig 3. Covariate balance between facilities with significantly worse readmission and facilities with non-significant readmission before and after matching for the 2010 cohort.

Suppl. Fig 4. Comparison of patient staffing characteristics in dialysis facilities with significantly better (SB) readmission vs. facilities with non-significant (NS) readmission in the years 2010-2013 (N = number of facilities).

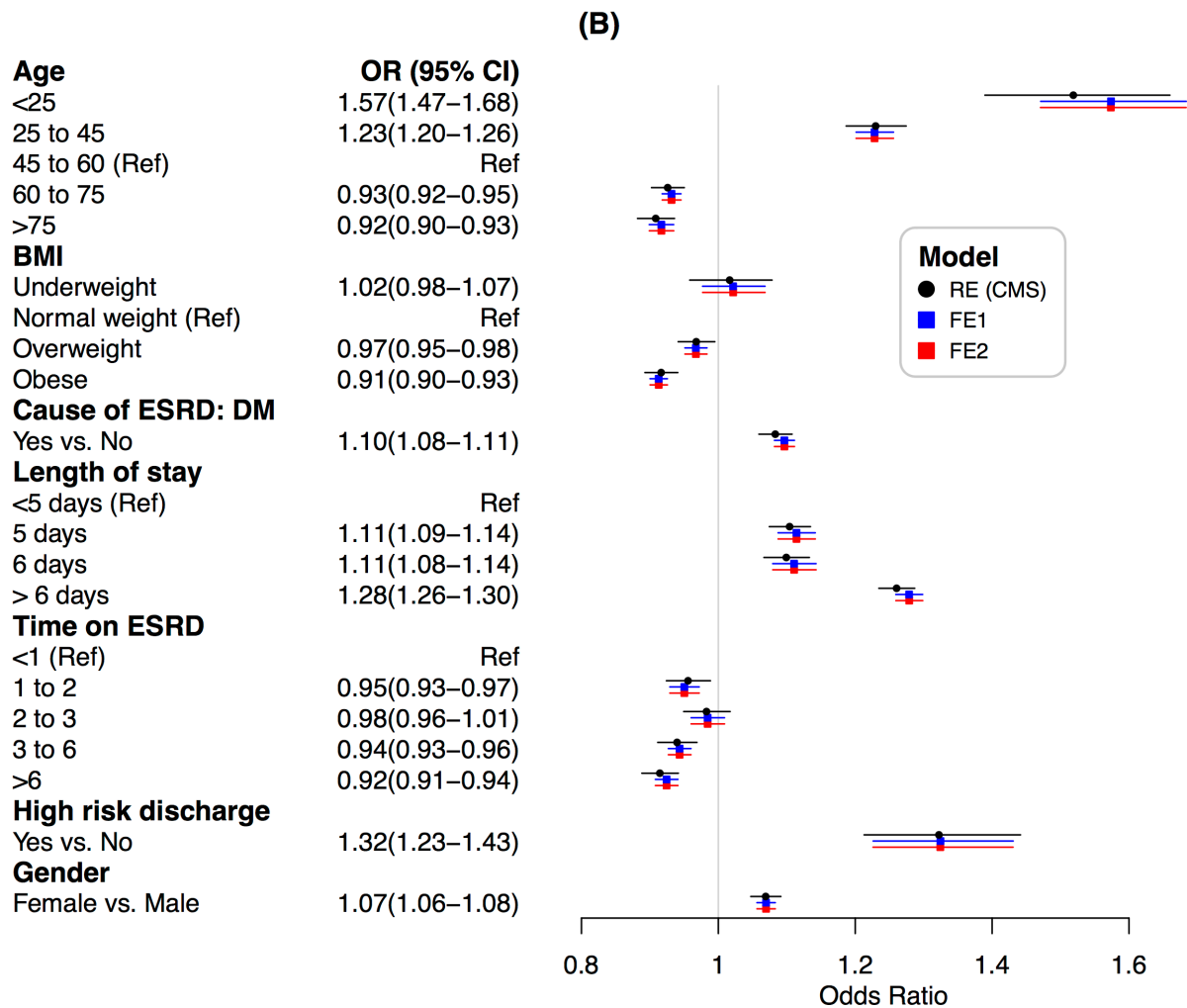
Suppl. Fig.1



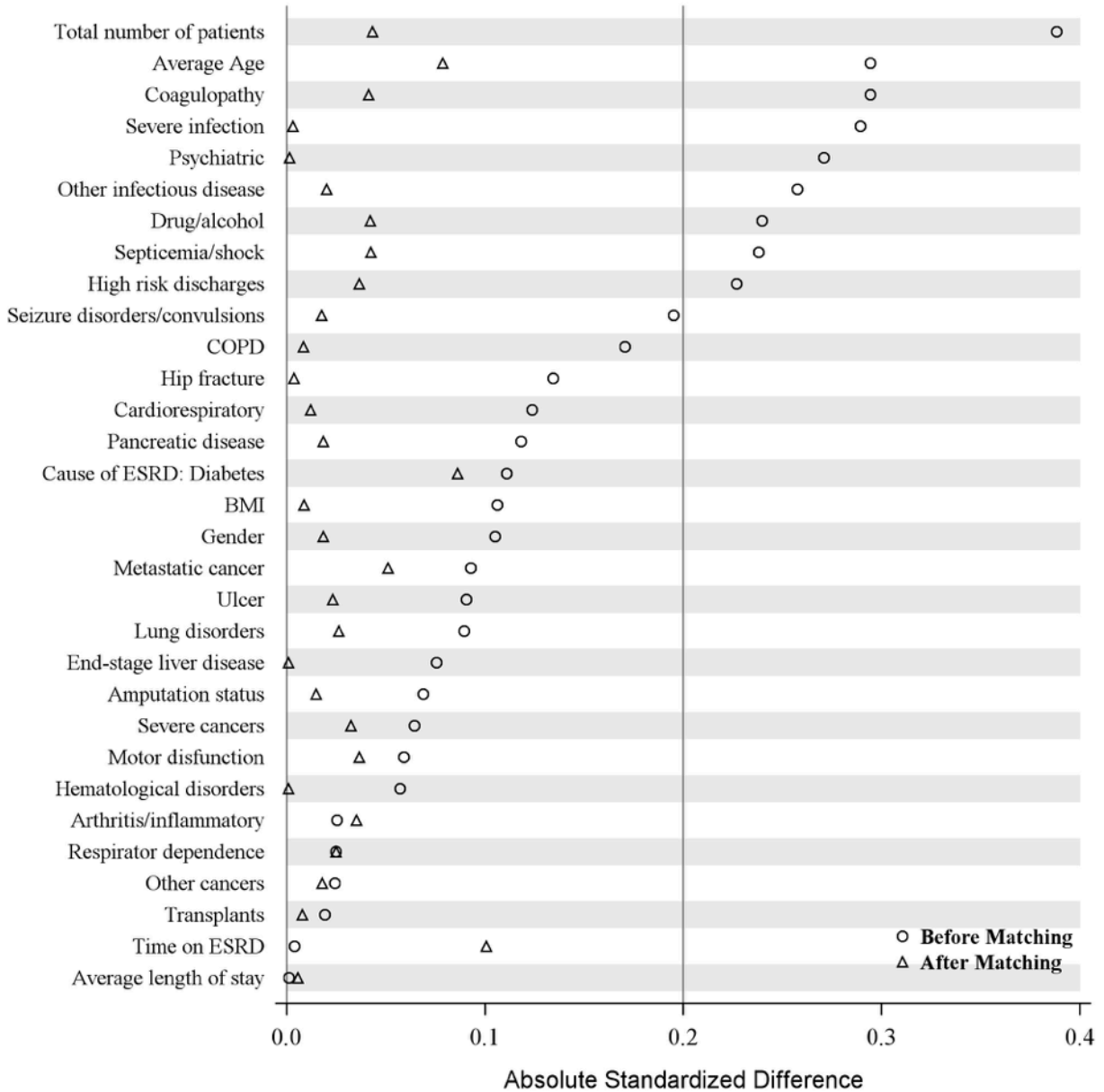
Suppl. Fig.2A



Suppl. Fig.2B



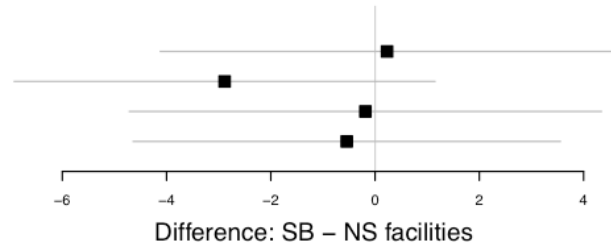
Suppl. Fig.3



Suppl. Fig.4

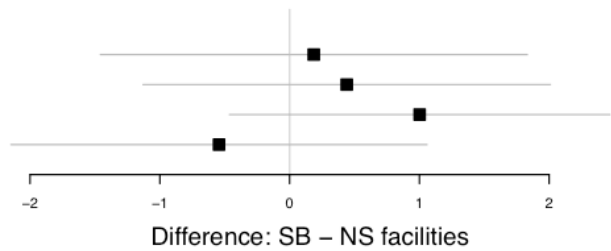
(A) Percent nurse-to-total staff

Year	N (SB Fac.)	N (NS Fac.)	Estimate	P-value
2010	67	334	0.23	0.918
2011	72	360	-2.886	0.162
2012	64	320	-0.186	0.936
2013	68	340	-0.544	0.795



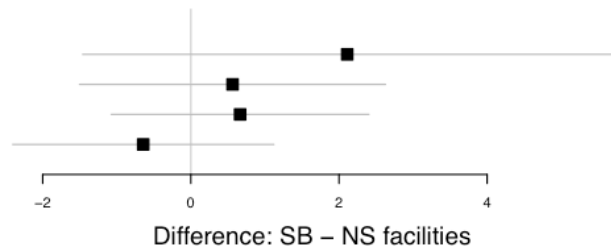
(B) Patient-to-nurse ratio

Year	N (SB Fac.)	N (NS Fac.)	Estimate	P-value
2010	67	334	0.186	0.824
2011	72	360	0.44	0.583
2012	64	320	1.002	0.181
2013	68	340	-0.544	0.506



(C) Patient-to-RN ratio

Year	N (SB Fac.)	N (NS Fac.)	Estimate	P-value
2010	67	334	2.111	0.247
2011	72	360	0.563	0.594
2012	64	320	0.665	0.454
2013	68	340	-0.643	0.475



(D) Patient-to-total staff ratio

Year	N (SB Fac.)	N (NS Fac.)	Estimate	P-value
2010	67	334	-0.272	0.206
2011	72	360	0.116	0.547
2012	64	320	0.083	0.659
2013	68	340	-0.178	0.37

