

Thirty-Day All-Cause Unplanned Readmission Following Psychiatric Hospitalization in an Inpatient Psychiatric Facility (IPF Readmission)

Risk Adjustment Attachment

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Submitted by:

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Risk Adjustment Attachment

Table 7. Analysis of candidate risk factor frequencies using CCS categories

Risk factor	Frequency	Percent	Observed readmission rate with risk factor	Observed readmission rate without risk factor	Selected into the final risk-adjustment model (Y/N)	% Bootstrap samples in which a risk-factor had a p-value <0.15
Sex					Y	
Male	142,424	50.94%	0.21	0.17	Y	100.0%
Female	137,155	49.06%	0.17	0.21	Y	100.0%
Age at admission					Y	
18 to 34	38,933	13.93%	0.24	0.18	Y	100.0%
35 to 44	44,481	15.91%	0.23	0.18	Y	100.0%
45 to 54	38,615	13.81%	0.21	0.19	Y	100.0%
55 to 64	44,740	16.00%	0.20	0.19	Y	100.0%
65 to 74	60,843	21.76%	0.16	0.20	Y	100.0%
75 to 84	36,982	13.23%	0.14	0.20	Y	100.0%
85+	14,985	5.36%	0.13	0.19	Y	100.0%
Principal discharge diagnosis					Y	
CCS 650 Adjustment disorders	2,819	1.01%	0.15	0.19	Y	100.0%
CCS 651 Anxiety disorders	3,930	1.41%	0.17	0.19	Y	100.0%
CCS 652/654/655 Attention-deficit, conduct, and disruptive behavior disorders/Developmental disorders/Disorders usually diagnosed in infancy, childhood, or adolescence	942	0.34%	0.17	0.19	Y	100.0%
CCS 653 Delirium, dementia, and amnestic and other cognitive disorders	32,319	11.56%	0.15	0.20	Y	100.0%
CCS 656 Impulse control disorders	845	0.30%	0.17	0.19	Y	100.0%
CCS 657.1 Bipolar disorder	50,008	17.89%	0.20	0.19	Y	100.0%

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Risk factor	Frequency	Percent	Observed readmission rate with risk factor	Observed readmission rate without risk factor	Selected into the final risk-adjustment model (Y/N)	% Bootstrap samples in which a risk-factor had a p-value <0.15
CCS 657.2/662 Depressive disorder	62,603	22.39%	0.16	0.20	Y	100.0%
CCS 658 Personality disorders	1,285	0.46%	0.23	0.19	Y	100.0%
CCS 659.1 Schizo-affective disorder	58,820	21.04%	0.24	0.18	Y	100.0%
CCS 659.2 Psychosis	50,734	18.15%	0.19	0.19	Y	100.0%
CCS 660 Alcohol-related disorders	8,817	3.15%	0.20	0.19	Y	100.0%
CCS 661 Substance-related disorders	5,881	2.10%	0.20	0.19	Y	100.0%
CCS 670/663 Screening and history of mental health and substance abuse codes	576	0.21%	0.16	0.19	Y	100.0%
Clinical comorbidities					Y	
Other Infection (CC 1)	57,944	20.73%	0.24	0.18	Y	100.0%
Heart Failure (CC 10)	24,141	8.63%	0.22	0.19	Y	96.8%
Arrhythmia (CC 11)	35,401	12.66%	0.21	0.19	Y	78.2%
Asthma (CC 12)	39,852	14.25%	0.25	0.18	Y	99.5%
Dialysis (CC 13)	794	0.28%	0.27	0.19	N	29.8%
Endocrine Disease (CC 15)	79,783	28.54%	0.24	0.17	Y	100.0%
Anemia (CC 16)	77,677	27.78%	0.23	0.18	Y	100.0%
Pancreatic Disease (CC 20)	1,587	0.57%	0.29	0.19	N	12.5%
Urinary Tract Disorder (CC 21)	14,765	5.28%	0.22	0.19	Y	97.2%
Coagulation Defects (CC 22)	13,325	4.77%	0.24	0.19	N	26.9%
Peptic Ulcer (CC 23)	14,182	5.07%	0.26	0.19	Y	99.9%
Infection (CC 24)	25,426	9.09%	0.26	0.18	N	68.9%
Liver Disease (CC 25)	23,238	8.31%	0.27	0.18	Y	100.0%
Heart Disease (CC 26)	71,192	25.46%	0.21	0.19	Y	99.4%
COPD/Fibrosis (CC 28)	47,498	16.99%	0.22	0.18	Y	99.8%
Injury (CC 34)	117,145	41.90%	0.24	0.16	Y	100.0%
Diabetes Acute Complications (CC 4.1)	983	0.35%	0.26	0.19	N	14.8%

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Risk factor	Frequency	Percent	Observed readmission rate with risk factor	Observed readmission rate without risk factor	Selected into the final risk-adjustment model (Y/N)	% Bootstrap samples in which a risk-factor had a p-value <0.15
Diabetes Chronic Complications (CC 4.2)	36,221	12.96%	0.21	0.19	N	18.1%
Diabetes (CC 5)	64,334	23.01%	0.21	0.19	Y	100.0%
Hallucination (CC 50.1)	15,349	5.49%	0.28	0.19	Y	100.0%
Drug/Alcohol Psychosis (CC 54)	11,961	4.28%	0.31	0.19	Y	99.6%
Drug/Alcohol Dependence/Abuse (CC 55-56)	118,488	42.38%	0.24	0.16	Y	100.0%
Nicotine Dependence Disorder (CC 56.1)	121,326	43.40%	0.24	0.15	Y	100.0%
Schizophrenia/Psychosis (CC 57/58.3/59)	132,468	47.38%	0.24	0.15	Y	100.0%
Bipolar Disorder (CC 58.1)	103,135	36.89%	0.25	0.16	Y	100.0%
Depressive Disorder (CC 58.2/61)	128,971	46.13%	0.22	0.17	Y	100.0%
Antisocial Disorder (CC 60.1)	4,502	1.61%	0.36	0.19	Y	99.9%
Other Personality Disorders (CC 60.2)	34,523	12.35%	0.26	0.18	Y	100.0%
Anxiety (CC 62.1)	172,846	61.82%	0.21	0.16	Y	100.0%
PTSD (CC 62.2)	50,965	18.23%	0.24	0.18	N	56.3%
Other Psychiatric Disorders (CC 63)	59,259	21.20%	0.24	0.18	Y	99.7%
Intellectual Disability (CC 64-67)	24,870	8.90%	0.24	0.19	N	51.6%
Development Disorders (CC 68-69)	27,071	9.68%	0.25	0.18	N	17.9%
Hematological Disorder (CC 7)	822	0.29%	0.24	0.19	Y	75.7%
Seizures (CC 9)	35,091	12.55%	0.25	0.18	Y	100.0%
History of being discharged against medical advice (AMA)					Y	
Discharged AMA in prior 12 months	10,536	3.77%	0.36	0.18	Y	100.0%
Not discharged AMA in prior 12 months	161,608	57.80%	0.23	0.14	Y	100.0%
No discharges in prior 12 months	107,435	38.43%	0.11	0.24	Y	100.0%
History of suicidality (i.e. suicide attempt, suicidal ideation, intentional self-harm)	155,465	55.61%	0.22	0.15	Y	100.0%
Aggression	47,302	16.92%	0.27	0.18	Y	100.0%

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Table 8. Risk adjustment factors and testing results

Risk adjustment variable	Odds ratio	95% CI		P-value
Female (Reference category)				
Male	1.15	1.12	1.18	<.0001
18 to 34	1.31	1.22	1.41	<.0001
35 to 44	1.23	1.14	1.32	<.0001
45 to 54	1.15	1.07	1.23	0.00
55 to 64	1.10	1.02	1.17	0.01
65 to 74	1.01	0.95	1.08	0.66
75 to 84	0.99	0.93	1.06	0.85
85+ (Reference category)				
Principal discharge diagnosis on index admission				
CCS 650 Adjustment disorders	0.75	0.67	0.85	<.0001
CCS 651 Anxiety disorders	0.92	0.83	1.01	0.08
CCS 652/654/655 Attention-deficit, conduct, and disruptive behavior disorders/Developmental disorders/Disorders usually diagnosed in infancy, childhood, or adolescence	0.81	0.67	0.98	0.03
CCS 653 Delirium, dementia, and amnestic and other cognitive disorders	1.10	1.04	1.15	0.00
CCS 656 Impulse control disorders	0.79	0.65	0.96	0.02
CCS 657.1 Bipolar disorder	0.94	0.90	0.97	0.00
CCS 657.2/662 Depressive disorder	0.87	0.83	0.90	<.0001
CCS 658 Personality disorders	0.93	0.80	1.08	0.32
CCS 659.1 Schizo-affective disorder (Reference category)				
CCS 659.2 Psychosis	0.93	0.90	0.96	<.0001
CCS 660 Alcohol-related disorders	0.92	0.86	0.99	0.02
CCS 661 Substance-related disorders	0.83	0.77	0.89	<.0001
CCS 670/663 Screening and history of mental health and substance abuse codes	0.82	0.64	1.05	0.12
Comorbidities				
Psychiatric				
Hallucination (CC 50.1)	1.19	1.14	1.24	<.0001
Drug/Alcohol Psychosis (CC 54)	1.14	1.09	1.19	<.0001

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Risk adjustment variable	Odds ratio	95% CI		P-value
Drug/Alcohol Dependence/Abuse (CC 55-56)	1.09	1.06	1.12	<.0001
Schizophrenia/Psychosis (CC 57/58.3/59)	1.17	1.14	1.20	<.0001
Bipolar Disorder (CC 58.1)	1.21	1.18	1.24	<.0001
Depressive Disorder (CC 58.2/61)	1.12	1.09	1.14	<.0001
Antisocial Disorder (CC 60.1)	1.20	1.12	1.29	<.0001
Other Personality Disorders (60.2)	1.13	1.10	1.17	<.0001
Anxiety (CC 62.1)	1.05	1.03	1.08	<.0001
PTSD (CC 62.2)*				
Other Psychiatric Disorders (CC 63)	1.07	1.04	1.10	<.0001
Intellectual Disability (CC 64-67)*				
Development Disorders (CC 68-69)*				
Non-psychiatric				
Other Infection (CC 1)	1.07	1.04	1.10	<.0001
Heart Failure (CC 10)	1.07	1.03	1.12	0.00
Arrhythmia (CC 11)	1.06	1.02	1.09	0.00
Asthma (CC 12)	1.07	1.04	1.10	<.0001
Dialysis (CC 13)*				
Endocrine Disease (CC 15)	1.09	1.06	1.12	<.0001
Anemia (CC 16)	1.08	1.06	1.11	<.0001
Pancreatic Disease (CC 20)*				
Urinary Tract Disorder (CC 21)	1.03	0.99	1.08	0.16
Coagulation Defects (CC 22)*				
Peptic Ulcer (CC 23)	1.08	1.04	1.13	0.00
Infection (CC 24)*				
Liver Disease (CC 25)	1.13	1.09	1.17	<.0001
Heart Disease (CC 26)	1.05	1.02	1.08	0.00
COPD/Fibrosis (CC 28)	1.04	1.01	1.07	0.01
Injury (CC 34)	1.12	1.10	1.15	<.0001
Diabetes Acute Complications (CC 4.1)*				

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Risk adjustment variable	Odds ratio	95% CI		P-value
Diabetes Chronic Complications (CC 4.2)*				
Diabetes (CC 5)	1.08	1.05	1.11	<.0001
Nicotine Dependence Disorder (CC 56.1)	1.17	1.14	1.20	<.0001
Hematological Disorder (CC 7)	1.00	0.84	1.20	0.97
Seizures (CC 9)	1.07	1.04	1.10	<.0001
Patient claims history data				
Discharged AMA in prior 12 months	1.90	1.80	2.01	<.0001
Not discharged AMA in prior 12 months	1.43	1.39	1.47	<.0001
No discharges in prior 12 months (Reference category)				
Suicide attempt/self-harm	1.13	1.10	1.16	<.0001
Aggression	1.12	1.09	1.15	<.0001

* Variables not selected in the final model.

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Table 9a. Distribution of the observed and risk-adjusted score (by sex, age, and clinical risk-factors)

Risk-adjustment model	N	Mean	min	p10	p20	p30	p40	p50	p60	p70	p80	p90	max
No risk adjustment (observed rate)	1,547	17.7%	0.0%	9.3%	12.4%	14.3%	16.1%	17.7%	19.2%	21.1%	23.0%	26.2%	100.0%
Sex, age, and clinical risk factors	1,547	19.2%	13.2%	16.3%	17.2%	17.9%	18.5%	19.0%	19.5%	20.2%	21.1%	22.4%	31.3%