

Supplementary Tables

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Table S1. Frequently prescribed drugs with moderate or high PIP among Medicare Advantage members hospitalized with COVID-19.

Generic Name	Drug Class	Minimum patient PIP associated with drug	Frequency, No. (%)
Metoprolol	Beta blockers	46%	1422 (24%)
Pantoprazole	Proton-pump inhibitors	29%	730 (12%)
Omeprazole	Proton-pump inhibitors	30%	571 (9%)
Escitalopram	Selective serotonin-reuptake Inhibitors	33%	365 (6%)
Citalopram	Selective serotonin-reuptake Inhibitors	32%	207 (3%)

PIP: pharmacogenetic interaction probability.

Table S2. Distribution of length of stay among Medicare Advantage members hospitalized with COVID-19 by pharmacogenomic risk and drug-drug interaction.

Medication risk measure	Pharmacogenomic risk category	LOS (days), Mean (95% CI)	LOS (days) Median
PIP	Low ($\leq 25\%$)	12.0 (11.6–12.4)	8
	Moderate (26%–50%)	13.2 (12.7–13.7)	9
	High ($> 50\%$)	13.8 (13–14.6)	9
DDI	Minimal or minor	12.4 (12–12.8)	8
	Moderate, major, or contraindicated	12.7 (12.3–13.1)	8

The average LOS (in days) for each unique DDI severity category were minimal: 12.0 for minimal DDI, 12.5 for minor DDI, 13.1 for moderate DDI, 12.6 for major DDI, and 12.6 for contraindicated DDI. LOS: length of stay; PIP: pharmacogenetic interaction probability; DDI: drug-drug interaction.

Table S3. Length-of-stay ratios of covariates in the ZTNB baseline model.

Variable	Rate Ratio (95% CI)	p-value
Moderate PIP (26% – 50%) ^a	1.09 (1.04, 1.15)	<0.001
High PIP ($> 50\%$) ^a	1.16 (1.08, 1.24)	<0.001
Moderate, major, or contraindicated DDI ^b	1.02 (0.98, 1.06)	0.384
Age	1.005 (1.003, 1.007)	<0.001
Gender ^c	1.08 (1.03, 1.13)	0.001

^aLow PIP (0–25%) as baseline; ^bMinimal or minor DDI as baseline; ^cfemale as baseline. ZTNB: zero-truncated negative binomial; PIP: pharmacogenetic interaction probability; DDI: drug-drug interaction.

Table S4. Distribution of patients by HCC count subpopulation, pharmacogenomic risk, and drug-drug interaction categories.

HCC Count	Patients, No. (%)	No. of patients by PIP			No. of patients by DDI	
		Low ($\leq 25\%$)	Moderate (26%–50%)	High ($> 50\%$)	Minimal or minor	Moderate, major, or contraindicated
0 or 1	1460 (24.2)	989	377	94	954	506
2 or 3	1991 (33.1)	1245	542	204	1083	908
4 or 5	1182 (19.6)	597	388	197	519	663
6 or more	1392 (23.1)	683	477	232	554	838

HCC: hierarchical conditions categories; PIP: pharmacogenomic interaction probability; DDI: drug-drug interaction.

Table S5. Length-of-stay ratios in the ZTNB regression model for all Medicare Advantage members hospitalized with COVID-19.

Variable	Description	Ratio	95% C.I.	p-value
(Intercept)	Intercept	7.12	(5.41, 9.37)	<0.001
Moderate PIP ^a	26 to 50%	1.09	(1.04, 1.14)	<0.001
High PIP ^a	> 50%	1.16	(1.09, 1.24)	<0.001
DDI Category 1 ^b	Moderate, major, or contraindicated	1.04	(1.00, 1.09)	0.066
Age	Age of a patient (2019)	1.007	(1.004, 1.009)	<0.001
Income	Median household income per ZCTA level (standardized)	1.06	(1.04, 1.09)	<0.001
RAF Score	Risk adjustment factor score	1.02	(1.00, 1.04)	0.108
D-SNP	Enrolled for at least one month in the dual — eligible special needs plan	0.93	(0.85, 1.02)	0.136
I-SNP	Enrolled for at least one month in the institutional special needs plan	0.73	(0.70, 0.77)	<0.001
Gender ^c	Gender of a patient	1.05	(1.00, 1.10)	0.027
Race/ethnicity Code 1 ^d	White (non-Hispanic)	0.97	(0.77, 1.21)	0.769
Race/ethnicity Code 2 ^d	Black (non-Hispanic)	0.97	(0.77, 1.22)	0.806
Race/ethnicity Code 3 ^d	Other	1.03	(0.79, 1.33)	0.845
Race/ethnicity Code 4 ^d	Asian/Pacific Islander	0.89	(0.68, 1.18)	0.426
Race/ethnicity Code 5 ^d	Hispanic/Latino	0.90	(0.70, 1.16)	0.430
HCC009	Lung and other severe cancers	0.76	(0.64, 0.90)	0.002
HCC017	Diabetes with acute complications	0.88	(0.74, 1.05)	0.160
HCC023	Other significant endocrine and metabolic disorders	0.92	(0.84, 1.01)	0.079
HCC027	End-stage liver disease	1.38	(1.04, 1.82)	0.026
HCC033	Intestinal obstruction/perforation	1.05	(0.93, 1.19)	0.443
HCC039	Bone/joint/muscle infections/necrosis	1.14	(1.00, 1.30)	0.051

HCC046	Severe hematological disorders	0.73	(0.57, 0.94)	0.013
HCC047	Disorders of immunity	0.92	(0.79, 1.07)	0.269
HCC048	Coagulation defects and other specified hematological disorders	1.06	(0.97, 1.15)	0.192
HCC054	Substance use with psychotic complications	1.27	(0.92, 1.74)	0.147
HCC055	Substance use disorder, moderate/severe or substance use with complications	1.08	(0.95, 1.23)	0.234
HCC057	Schizophrenia	1.13	(1.02, 1.25)	0.018
HCC072	Spinal cord disorders/injuries	1.18	(0.97, 1.44)	0.106
HCC073	Amyotrophic lateral sclerosis and other motor neuron disease	1.28	(0.71, 2.30)	0.416
HCC077	Multiple sclerosis	1.41	(1.20, 1.66)	<0.001
HCC082	Respirator dependence/ tracheostomy status	1.22	(0.96, 1.56)	0.101
HCC084	Cardio-respiratory failure and shock	1.07	(0.98, 1.16)	0.124
HCC099	Cerebral hemorrhage	1.09	(0.91, 1.31)	0.324
HCC103	Hemiplegia/hemiparesis	1.06	(0.97, 1.15)	0.195
HCC104	Monoplegia, other paralytic syndromes	0.63	(0.43, 0.94)	0.022
HCC107	Vascular disease with complications	1.10	(0.99, 1.23)	0.088
HCC112	Fibrosis of lung and other chronic lung disorders	0.69	(0.54, 0.89)	0.004
HCC114	Aspiration and specified bacterial pneumonias	1.02	(0.90, 1.15)	0.758
HCC115	Pneumococcal pneumonia, empyema, lung abscess	0.91	(0.80, 1.05)	0.191
HCC134	Dialysis status	0.91	(0.80, 1.05)	0.194
HCC135	Acute renal failure	1.01	(0.95, 1.09)	0.684
HCC137	Chronic kidney disease, severe (stage 4)	0.83	(0.69, 1.00)	0.046
HCC161	Chronic ulcer of skin, except pressure	1.07	(0.98, 1.17)	0.144
HCC169	Vertebral fractures without spinal cord injury	1.13	(0.96, 1.32)	0.149

HCC170	Hip fracture/dislocation	1.23	(1.09, 1.38)	0.001
HCC173	Traumatic amputations and complications	1.16	(0.94, 1.43)	0.171

^a0–25% PPI as baseline; ^bminimal or minor DDI as baseline; ^cfemale as baseline; ^dunknown race/ethnicity as baseline. Significance was set at $p < 0.05$. Variables shown were determined by least absolute shrinkage and selection operator analysis, which can vary by cohort subgroup. ZTNB: zero-truncated negative binomial; HCC: hierarchical conditions categories. PIP: pharmacogenomic interaction probability; DDI: drug-drug interaction; D-SNP: dual special needs plan; I-SNP: institutional special needs plan.

Table S6. Expected length-of-stay ratios in the ZTNB regression model for patients with zero or one HCC.

Variable	Description	Ratio	95% C.I.	<i>p</i> -value
(Intercept)	Intercept	4.93	(2.91, 8.34)	<0.001
Moderate PIP ^a	26 to 50%	1.15	(1.04, 1.28)	0.007
High PIP ^a	>50%	1.39	(1.15, 1.67)	<0.001
DDI Category 1 ^b	Moderate, major, or contraindicated	0.91	(0.82, 1.00)	0.045
Age	Age of a patient (2019)	1.015	(1.010, 1.020)	<0.001
Income	Median household income per ZCTA level (standardized)	1.03	(0.99, 1.08)	0.188
C-SNP	Enrolled for at least one month in the chronic or disabling condition special needs plan	0.89	(0.68, 1.15)	0.372
D-SNP	Enrolled for at least one month in the dual — eligible special needs plan	0.74	(0.58, 0.94)	0.012
I-SNP	Enrolled for at least one month in the institutional special needs plan	0.75	(0.67, 0.84)	<0.001
Gender ^c	Gender of a patient	1.08	(0.98, 1.19)	0.107
Race/ethnicity Code 1 ^d	White (non-Hispanic)	0.73	(0.50, 1.06)	0.101
Race/ethnicity Code 2 ^d	Black (non-Hispanic)	0.69	(0.47, 1.01)	0.059
Race/ethnicity Code 3 ^d	Other	0.57	(0.36, 0.88)	0.012
Race/ethnicity Code 4 ^d	Asian/Pacific Islander	0.73	(0.47, 1.14)	0.166
Race/ethnicity Code 5 ^d	Hispanic/Latino	0.61	(0.40, 0.93)	0.022
HCC010	Lymphoma and other cancers	1.36	(0.72, 2.56)	0.338

HCC012	Breast, prostate, and other cancers and tumors	0.86	(0.63, 1.17)	0.333
HCC022	Morbid obesity	0.87	(0.59, 1.30)	0.506
HCC040	Rheumatoid arthritis and inflammatory connective tissue disease	1.52	(1.10, 2.10)	0.012
HCC057	Schizophrenia	1.50	(0.97, 2.33)	0.071
HCC058	Reactive and unspecified psychosis	1.40	(1.08, 1.82)	0.011
HCC077	Multiple sclerosis	1.45	(0.79, 2.63)	0.227
HCC079	Seizure disorders and convulsions	0.64	(0.41, 1.00)	0.052
HCC085	Congestive heart failure	0.88	(0.65, 1.20)	0.422
HCC115	Pneumococcal pneumonia, empyema, lung abscess	2.62	(1.33, 5.17)	0.005
HCC124	Exudative macular degeneration	1.15	(0.67, 1.95)	0.616

^a0–25% PIP as baseline; ^bminimal or minor DDI as baseline; ^cfemale as baseline; ^dunknown race/ethnicity as baseline. Significance was set at $p < 0.05$. Variables shown were determined by least absolute shrinkage and selection operator analysis, which can vary by cohort subgroup. ZTNB: zero-truncated negative binomial; HCC: hierarchical conditions categories. PIP: pharmacogenomic interaction probability; DDI: drug-drug interaction; C-SNP: chronic condition special needs plan; D-SNP: dual special needs plan; I-SNP: institutional special needs plan.

Table S7. Expected length-of-stay ratios in the ZTNB regression model for patients with two or three HCC.

Variable	Description	Ratio	95% C.I.	<i>p</i> -value
(Intercept)	Intercept	6.25	(3.91, 10.01)	<0.001
Moderate PIP ^a	26% to 50%	1.03	(0.95, 1.11)	0.522
High PIP ^a	>50%	1.08	(0.96, 1.21)	0.204
DDI Category 1 ^b	Moderate, major, or contraindicated	1.10	(1.02, 1.18)	0.010
Age	Age of a patient (2019)	1.004	(1.000, 1.007)	0.028
Income	Median household income per ZCTA level (standardized)	1.07	(1.03, 1.11)	<0.001
I-SNP	Enrolled for at least one month in the institutional special needs plan	0.77	(0.72, 0.83)	<0.001
Race/ethnicity Code 1 ^c	White (non-Hispanic)	1.42	(0.94, 2.14)	0.098
Race/ethnicity Code 2 ^c	Black (non-Hispanic)	1.46	(0.97, 2.21)	0.073

Race/ethnicity Code 3 ^c	Other	1.74	(1.10, 2.76)	0.018
Race/ethnicity Code 4 ^c	Asian/Pacific Islander	1.10	(0.66, 1.83)	0.720
Race/ethnicity Code 5 ^c	Hispanic/Latino	1.54	(0.98, 2.44)	0.061
HCC018	Diabetes with chronic complications	0.92	(0.86, 1.00)	0.043
HCC023	Other significant endocrine and metabolic disorders	0.81	(0.66, 1.00)	0.045
HCC054	Substance use with psychotic complications	1.66	(0.91, 3.03)	0.099
HCC058	Reactive and unspecified psychosis	1.09	(0.99, 1.21)	0.084
HCC072	Spinal cord disorders/injuries	1.67	(1.10, 2.52)	0.015
HCC084	Cardio-respiratory failure and shock	1.40	(1.03, 1.90)	0.033
HCC106	Atherosclerosis of extremity with ulceration or gangrene	1.51	(1.05, 2.17)	0.025
HCC112	Fibrosis of lung and other chronic lung disorders	0.46	(0.27, 0.78)	0.004
HCC169	Vertebral fractures without spinal cord injury	1.25	(0.90, 1.72)	0.177
HCC170	Hip fracture/dislocation	1.45	(1.13, 1.85)	0.003

^a0–25% PIP as baseline; ^bminimal or minor DDI as baseline; ^cunknown race/ethnicity as baseline. Significance was set at $p < 0.05$. Variables shown were determined by least absolute shrinkage and selection operator analysis, which can vary by cohort subgroup. ZTNB: zero-truncated negative binomial; HCC: hierarchical condition categories; PIP: pharmacogenomic interaction probability; DDI: drug-drug interaction; I-SNP: institutional special needs plan.

Table S8. Expected length-of-stay ratios in the ZTNB regression model for patients with four or five HCC.

Variable	Description	Ratio	95% C.I.	<i>p</i> -value
(Intercept)	Intercept	12.97	(11.92, 14.11)	<0.001
Moderate PIP ^a	26 to 50%	1.13	(1.02, 1.25)	0.019
High PIP ^a	>50%	1.13	(1.00, 1.29)	0.057
DDI Category 1 ^b	Moderate, major, or contraindicated	1.07	(0.97, 1.17)	0.179
Income	Median household income per ZCTA level (standardized)	1.05	(1.01, 1.10)	0.021
I-SNP	Enrolled for at least one month in the institutional special needs plan	0.72	(0.65, 0.79)	<0.001

HCC09	Lung and other severe cancers	0.59	(0.42, 0.83)	0.002
HCC039	Bone/joint/muscle infections/necrosis	1.65	(1.22, 2.22)	0.001
HCC072	Spinal cord disorders/injuries	1.44	(0.92, 2.28)	0.114
HCC077	Multiple sclerosis	1.45	(1.09, 1.92)	0.010
HCC173	Traumatic amputations and complications	1.35	(0.85, 2.13)	0.199

^a0–25% PIP as baseline; ^bminimal or minor DDI as baseline. Significance was set at $p < 0.05$. Variables shown were determined by least absolute shrinkage and selection operator analysis, which can vary by cohort subgroup. ZTNB: zero-truncated negative binomial; HCC: hierarchical conditions categories; PIP: pharmacogenomic interaction probability; DDI: drug–drug interaction; I-SNP: institutional special needs plan.

Table S9. Expected length-of-stay ratios in the ZTNB regression model for patients with six or more chronic conditions.

Variable	Description	Ratio	95% C.I.	<i>p</i> -value
(Intercept)	Intercept	12.37	(10.54, 14.51)	<0.001
Moderate PIP ^a	26% to 50%	1.08	(0.98, 1.18)	0.112
High PIP ^a	>50%	1.16	(1.03, 1.31)	0.014
DDI Category 1 ^b	Moderate, major, or contraindicated	1.01	(0.93, 1.11)	0.786
Income	Median household income per ZCTA level (standardized)	1.08	(1.03, 1.12)	<0.001
RAF Score	Risk adjustment factor score	1.02	(0.99, 1.05)	0.239
I-SNP	Enrolled for at least one month in the institutional special needs plan	0.66	(0.59, 0.73)	<0.001
Gender ^c	Gender of a patient	1.11	(1.01, 1.20)	0.022
HCC008	Metastatic cancer and acute leukemia	1.26	(0.99, 1.58)	0.056
HCC009	Lung and other severe cancers	0.83	(0.65, 1.06)	0.134
HCC012	Breast, prostate, and other cancers and tumors	1.20	(1.02, 1.41)	0.025
HCC023	Other significant endocrine and metabolic disorders	0.91	(0.81, 1.03)	0.135
HCC027	End-stage liver disease	1.34	(0.98, 1.84)	0.069
HCC028	Cirrhosis of liver	0.75	(0.56, 1.02)	0.064
HCC046	Severe hematological disorders	0.54	(0.38, 0.76)	<0.001
HCC054	Substance use with psychotic complications	1.35	(0.88, 2.07)	0.173

HCC055	Substance use disorder, moderate/severe or substance use with complications	1.11	(0.95, 1.30)	0.194
HCC077	Multiple sclerosis	1.37	(1.06, 1.78)	0.018
HCC099	Cerebral hemorrhage	1.30	(1.05, 1.60)	0.015
HCC108	Vascular disease	0.89	(0.82, 0.97)	0.009
HCC112	Fibrosis of lung and other chronic lung disorders	0.66	(0.46, 0.95)	0.025
HCC114	Aspiration and specified bacterial pneumonias	1.05	(0.92, 1.19)	0.479
HCC124	Exudative macular degeneration	1.23	(0.98, 1.55)	0.073
HCC134	Dialysis status	0.86	(0.74, 1.01)	0.075
HCC135	Acute renal failure	1.06	(0.96, 1.16)	0.252
HCC158	Pressure ulcer of skin with full thickness skin loss	1.15	(0.99, 1.34)	0.069
HCC170	Hip fracture/dislocation	1.12	(0.95, 1.33)	0.167

^a0–25% PIP as baseline; ^bminimal or minor DDI as baseline; ^cfemale as baseline. Significance was set at $p < 0.05$. Variables shown were determined by least absolute shrinkage and selection operator analysis, which can vary by cohort subgroup. ZTNB: zero-truncated negative binomial; PIP: pharmacogenomic interaction probability; DDI: drug-drug interaction; RAF: risk adjustment factor; I-SNP: institutional special needs plan.

Table S10. Distribution of patients by chronic condition subpopulation, pharmacogenomic risk, and drug-drug interaction risk.

Condition Group	Patient Count (%)	No. of patients by PIP			No. of patients by DDI	
		≤25%	26% to 50%	>50%	Minimal or minor	Moderate, major, or contraindicated
Hypertension	1902 (31.6)	984	620	298	887	1015
Hyperlipidemia	3499 (58.1)	1964	1078	457	1779	1720
Diabetes	3104 (51.5)	1675	983	446	1525	1579
COPD	1450 (24.1)	804	440	206	598	852

PIP: pharmacogenomic interaction probability; DDI: drug-drug interaction; COPD: chronic obstructive pulmonary disease.

Table S11. Expected length-of-stay ratios in the ZTNB regression model for patients with chronic obstructive pulmonary disease.

Variable	Description	Ratio	95% C.I.	p-value
(Intercept)	Intercept	5.31	(2.76, 10.24)	< 0.001
Moderate PIP ^a	26% to 50%	1.13	(1.03, 1.24)	0.009
High PIP ^a	>50%	1.18	(1.05, 1.34)	0.006

DDI Category 1 ^b	Moderate, major, or contraindicated	1.01	(0.93, 1.10)	0.796
Hypertension	Hypertension flag	1.05	(0.96, 1.15)	0.318
Hyperlipidemia	Hyperlipidemia flag	1.07	(0.98, 1.16)	0.122
Diabetes	Diabetes flag	0.95	(0.87, 1.04)	0.248
Age	Age of a patient (2019)	1.006	(1.001, 1.010)	0.010
Income	Median household income per ZCTA level (standardized)	1.04	(1.00, 1.09)	0.058
RAF Score	Risk adjustment factor score	1.01	(0.98, 1.04)	0.603
Gender ^c	Gender of a patient	1.10	(1.01, 1.20)	0.028
Race/ethnicity Code 1 ^d	White (non-Hispanic)	1.40	(0.80, 2.45)	0.233
Race/ethnicity Code 2 ^d	Black (non-Hispanic)	1.32	(0.76, 2.32)	0.325
Race/ethnicity Code 3 ^d	Other	1.37	(0.71, 2.61)	0.346
Race/ethnicity Code 4 ^d	Asian/Pacific Islander	1.14	(0.58, 2.21)	0.705
Race/ethnicity Code 5 ^d	Hispanic/Latino	1.14	(0.61, 2.13)	0.689
I-SNP	Enrolled for at least one month in the institutional special needs plan	0.71	(0.64, 0.77)	<0.001
HCC009	Lung and other severe cancers	0.70	(0.55, 0.89)	0.003
HCC027	End-stage liver disease	1.68	(1.12, 2.51)	0.011
HCC028	Cirrhosis of liver	0.73	(0.50, 1.05)	0.086
HCC039	Bone/joint/muscle infections/necrosis	1.11	(0.89, 1.37)	0.352
HCC046	Severe hematological disorders	0.75	(0.49, 1.15)	0.183
HCC047	Disorders of immunity	0.76	(0.58, 0.99)	0.038
HCC048	Coagulation defects and other specified hematological disorders	1.11	(0.97, 1.28)	0.134
HCC054	Substance use with psychotic complications	1.75	(1.07, 2.86)	0.026
HCC055	Substance use disorder, moderate/severe or substance use with complications	1.15	(0.96, 1.38)	0.131

HCC057	Schizophrenia	1.27	(1.07, 1.52)	0.007
HCC077	Multiple sclerosis	1.35	(1.00, 1.84)	0.053
HCC084	Cardio-respiratory failure and shock	1.07	(0.96, 1.20)	0.227
HCC104	Monoplegia, other paralytic syndromes	0.34	(0.16, 0.70)	0.003
HCC112	Fibrosis of lung and other chronic lung disorders	0.60	(0.40, 0.91)	0.017
HCC114	Aspiration and specified bacterial pneumonias	1.02	(0.86, 1.21)	0.834
HCC135	Acute renal failure	1.03	(0.92, 1.16)	0.566
HCC158	Pressure ulcer of skin with full thickness skin loss	1.12	(0.92, 1.35)	0.262
HCC167	Major head injury	1.55	(1.10, 2.19)	0.013
HCC170	Hip fracture/dislocation	1.12	(0.91, 1.37)	0.280

^a0–25% as baseline; ^bminimal or minor as baseline; ^cfemale as baseline; ^dunknown race/ethnicity as baseline. Significance was set at $p < 0.05$. ZTNB: zero-truncated negative binomial; PIP: pharmacogenomic interaction probability; DDI: drug–drug interaction; COPD: chronic obstructive pulmonary disease; RAF: risk adjustment factor; I-SNP: institutional special needs plan.

Table S12. Expected length-of-stay ratios in the ZTNB regression model for patients with diabetes.

Variable	Description	Ratio	95% C.I.	<i>p</i> -value
(Intercept)	Intercept	8.45	(6.60, 10.80)	<0.001
Moderate PIP ^a	26% to 50%	1.05	(0.99, 1.12)	0.119
High PIP ^a	>50%	1.15	(1.05, 1.25)	0.002
DDI Category 1 ^b	Moderate, major, or contraindicated	1.07	(1.01, 1.13)	0.031
Hypertension	Hypertension flag	0.98	(0.91, 1.04)	0.440
Hyperlipidemia	Hyperlipidemia flag	0.98	(0.92, 1.04)	0.544
COPD	COPD flag	0.98	(0.92, 1.06)	0.649
Age	Age of a patient (2019)	1.004	(1.001, 1.007)	0.008
Income	Median household income per ZCTA level (standardized)	1.08	(1.05, 1.11)	<0.001
RAF Score	Risk adjustment factor score	1.03	(1.00, 1.05)	0.033
Gender ^c	Gender of a patient	1.08	(1.01, 1.14)	0.016
D-SNP	Enrolled for at least one month in the dual-eligible special needs plan	0.91	(0.81, 1.03)	0.144

I-SNP	Enrolled for at least one month in the institutional special needs plan	0.72	(0.67, 0.77)	<0.001
HCC009	Lung and other severe cancers	0.70	(0.55, 0.88)	0.003
HCC010	Lymphoma and other cancers	1.25	(0.99, 1.57)	0.056
HCC017	Diabetes with acute complications	0.85	(0.72, 1.02)	0.075
HCC023	Other significant endocrine and metabolic disorders	0.94	(0.84, 1.05)	0.266
HCC027	End-stage liver disease	1.32	(0.94, 1.83)	0.106
HCC033	Intestinal obstruction/perforation	1.07	(0.91, 1.26)	0.436
HCC035	Inflammatory bowel disease	1.20	(0.91, 1.58)	0.191
HCC039	Bone/joint/muscle infections/necrosis	1.10	(0.94, 1.29)	0.217
HCC046	Severe hematological disorders	0.75	(0.55, 1.03)	0.071
HCC048	Coagulation defects and other specified hematological disorders	1.07	(0.96, 1.20)	0.214
HCC055	Substance use disorder, moderate/severe or substance use with complications	1.18	(0.99, 1.42)	0.072
HCC072	Spinal cord disorders/injuries	1.25	(0.93, 1.68)	0.141
HCC077	Multiple sclerosis	1.33	(1.04, 1.69)	0.022
HCC082	Respirator dependence/ tracheostomy status	1.32	(0.97, 1.79)	0.078
HCC099	Cerebral hemorrhage	1.24	(0.98, 1.57)	0.073
HCC103	Hemiplegia/hemiparesis	1.07	(0.96, 1.19)	0.211
HCC107	Vascular disease with complications	1.10	(0.95, 1.26)	0.208
HCC134	Dialysis status	0.87	(0.75, 1.02)	0.081
HCC135	Acute renal failure	1.02	(0.93, 1.11)	0.733
HCC161	Chronic ulcer of skin, except pressure	1.11	(0.99, 1.24)	0.077

^a0–25% PIP as baseline; ^bminimal or minor DDI as baseline; ^cfemale as baseline. Significance was set at $p < 0.05$. ZTNB: zero-truncated negative binomial; PIP: pharmacogenomic interaction probability; DDI: drug-drug interaction; COPD: chronic obstructive pulmonary disease; RAF: risk adjustment factor; I-SNP: institutional special needs plan.

Table S13. Expected length-of-stay ratios in the ZTNB regression model for patients with hyperlipidemia.

Variable	Description	Ratio	95% C.I.	p-value
(Intercept)	Intercept	6.46	(5.06, 8.24)	<0.001
Moderate PIP ^a	26% to 50%	1.08	(1.02, 1.15)	0.013
High PIP ^a	>50%	1.12	(1.02, 1.22)	0.014
DDI Category 1 ^b	Moderate, major, or contraindicated	1.05	(0.99, 1.11)	0.096
Hypertension	Hypertension flag	1.02	(0.96, 1.08)	0.585
Diabetes	Diabetes flag	1.00	(0.94, 1.06)	0.974
COPD	COPD flag	1.05	(0.98, 1.12)	0.209
Age	Age of a patient (2019)	1.007	(1.004, 1.010)	<0.001
Income	Median household income per ZCTA level (standardized)	1.07	(1.04, 1.10)	<0.001
RAF Score	Risk adjustment factor score	1.03	(1.00, 1.05)	0.027
Gender ^c	Gender of a patient	1.06	(1.00, 1.12)	0.068
I-SNP	Enrolled for at least one month in the institutional special needs plan	0.75	(0.71, 0.80)	<0.001
HCC009	Lung and other severe cancers	0.74	(0.58, 0.94)	0.015
HCC023	Other significant endocrine and metabolic disorders	0.87	(0.77, 0.97)	0.017
HCC028	Cirrhosis of liver	0.72	(0.51, 1.01)	0.059
HCC046	Severe hematological disorders	0.62	(0.45, 0.86)	0.004
HCC055	Substance use disorder, moderate/severe or substance use with complications	1.18	(1.01, 1.39)	0.038
HCC058	Reactive and unspecified psychosis	1.07	(0.98, 1.15)	0.123
HCC072	Spinal cord disorders/injuries	1.15	(0.88, 1.51)	0.307
HCC077	Multiple sclerosis	1.33	(1.04, 1.69)	0.022
HCC082	Respirator dependence/ tracheostomy status	1.51	(1.11, 2.07)	0.009
HCC084	Cardio-respiratory failure and shock	1.07	(0.97, 1.19)	0.184
HCC099	Cerebral hemorrhage	1.15	(0.89, 1.48)	0.284
HCC104	Monoplegia, other paralytic syndromes	0.58	(0.36, 0.94)	0.027

HCC112	Fibrosis of lung and other chronic lung disorders	0.78	(0.56, 1.07)	0.125
HCC167	Major head injury	1.06	(0.84, 1.35)	0.618
HCC170	Hip fracture/dislocation	1.22	(1.03, 1.45)	0.022

^a0–25% PIP as baseline; ^bminimal or minor DDI as baseline; ^cfemale as baseline. Significance was set at $p < 0.05$. ZTNB: zero-truncated negative binomial; PIP: pharmacogenomic interaction probability; DDI: drug-drug interaction; COPD: chronic obstructive pulmonary disease; RAF: risk adjustment factor; I-SNP: institutional special needs plan.

Table S14. Expected length-of-stay ratios in the ZTNB regression model for patients with hypertension.

Variable	Description	Ratio	95% C.I.	<i>p</i> -value
(Intercept)	Intercept	12.45	(11.24, 13.79)	<0.001
Moderate PIP ^a	26% to 50%	1.03	(0.95, 1.12)	0.478
High PIP ^a	>50%	1.22	(1.10, 1.35)	<0.001
DDI Category 1 ^b	Moderate, major, or contraindicated	1.02	(0.95, 1.10)	0.522
Hyperlipidemia	Hyperlipidemia flag	1.02	(0.95, 1.10)	0.617
Diabetes	Diabetes flag	0.93	(0.86, 1.00)	0.058
COPD	COPD flag	1.04	(0.95, 1.13)	0.403
Income	Median household income per ZCTA level (standardized)	1.08	(1.04, 1.11)	<0.001
RAF Score	Risk adjustment factor score	1.01	(0.99, 1.04)	0.321
I-SNP	Enrolled for at least one month in the institutional special needs plan	0.73	(0.68, 0.79)	<0.001
HCC039	Bone/joint/muscle infections/necrosis	1.17	(0.98, 1.40)	0.091
HCC084	Cardio-respiratory failure and shock	1.08	(0.97, 1.21)	0.148
HCC135	Acute renal failure	1.07	(0.97, 1.17)	0.175

^a0–25% PIP as baseline; ^bminimal or minor DDI as baseline. Significance was set at $p < 0.05$. ZTNB: zero-truncated negative binomial; PIP: pharmacogenomic interaction probability; DDI: drug-drug interaction; COPD: chronic obstructive pulmonary disease; RAF: risk adjustment factor; I-SNP: institutional special needs plan.