

Supplementary Material

Article Title: Prescribing of Z-Drugs With and Without Opioid Co-Prescribing to Primary Care Patients in a Large Health Care System From 2019–2020

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Supplementary material for “Prescribing of Z-drugs with and without opioid co-prescribing to primary care patients in a large healthcare system from 2019-2020”

Supplementary Table 1. Z-drug prescribing and Z-drug/opioid co-prescribing during study period sub-intervals*

Time Period	Number Of Patients Seen During Time Period	Prescribed Z-drug	Co-Prescribed Z-drug and Opioid	Co-Prescribing Rate Among Patients Prescribed Z-drug during interval
1/1/2019-3/23/2019	142099	1495 (1.05%)	209 (0.15%)	209/1495 (13.98%)
3/24/2019-12/31/2019 (Pre-lockdown)	307554	3690 (1.20%)	512 (0.17%)	512/3690 (13.88%)
1/1/2020-3/23/2020	142909	1343 (0.94%)	187 (0.13%)	187/1343 (13.92%)
3/24/2020-12/31/2020 (Post-lockdown)	293575	3500 (1.19%)	440 (0.15%)	440/3500 (12.57%)
2019	449653	4450 (0.99%)	650 (0.14%)	650/4450 (14.61%)
2020	436484	4221 (0.97%)	572 (0.13%)	572/4221 (13.55%)
Entire study period (2019-2020)	455537	6743 (1.48%)	1064 (0.23%)	1064/6743 (15.78%)

*Of note, when combining proportions of patients prescribed Z-drugs or co-prescribed Z-drugs and opioids during smaller intervals (such as 3 months or 9 months), these do not sum to the proportions reported for the larger intervals containing them (12 months or 24 months). For example, 13.98% of patients who received a Z-drug prescription from 1/1/2019-3/23/2019 were co-prescribed opioids, while this proportion was 13.88% from 3/24/2019-12/31/2019. However, the total was 14.61% of all patients prescribed a Z-drug in 2019. The reason prescription prevalence can be higher when looking at longer time periods is because the two smaller intervals within a larger interval are not mutually exclusive, and patients have more opportunity to be prescribed and/or co-prescribed medications at least once during a one-year or two-year period than a 3-month or 9-month period.

Supplementary Table 2. Patient characteristics pre-lockdown and post-lockdown*

	Pre-COVID (3/24/2019-12/31/2019)	Post-COVID (3/24/2020-12/31/2020)	Odds Ratio (95% CI)	P-value
N	307554	293575		
Age, mean (SD)	54.3 (17.9)	54.1 (18.0)	0.994 (0.992–0.995)	< 0.001
Gender				
Female	170372 (55.4%)	163833 (55.8%)	Reference	
Male	137161 (44.6%)	129711 (44.2%)	0.983 (0.977–0.990)	< 0.001
Nonbinary	4 (0.0%)	7 (0.0%)	1.535 (0.968–2.434)	0.068
X	6 (0.0%)	10 (0.0%)		
Other	2 (0.0%)	4 (0.0%)		
Unknown	9 (0.0%)	10 (0.0%)		
Race				
White	239064 (77.7%)	227821 (77.6%)	Reference	
Black	37309 (12.1%)	36075 (12.3%)	1.015 (1.005–1.024)	0.003
American Indian/Alaska Native	456 (0.1%)	476 (0.2%)	1.095 (1.007–1.192)	0.034
Asian	7694 (2.5%)	7099 (2.4%)	0.968 (0.948–0.989)	0.003

Multiracial/Multicultural	9560 (3.1%)	9616 (3.3%)	1.055 (1.036–1.076)	< 0.001
Hispanic/Latino	3 (0.0%)	3 (0.0%)	1.010 (0.957–1.066)	0.717
Native Hawaiian/Pacific Islander	3 (0.0%)	3 (0.0%)		
Other	927 (0.3%)	892 (0.3%)		
Unavailable	4466 (1.5%)	4643 (1.6%)	1.091 (1.059–1.123)	< 0.001
Declined	4143 (1.3%)	4063 (1.4%)	1.029 (1.001–1.058)	0.040
Unknown	3929 (1.3%)	2884 (1.0%)	0.770 (0.741–0.800)	< 0.001
Marital Status				
Married	166281 (54.1%)	157529 (53.7%)	Reference	
Domestic Partner	989 (0.3%)	1122 (0.4%)	1.198 (1.134–1.265)	< 0.001
Single	94614 (30.8%)	91229 (31.1%)	1.018 (1.010–1.025)	< 0.001
Divorced	21180 (6.9%)	20530 (7.0%)	1.023 (1.012–1.035)	< 0.001
Legally Separated	1780 (0.6%)	1711 (0.6%)	1.015 (0.974–1.057)	0.481
Widowed	16124 (5.2%)	15358 (5.2%)	1.005 (0.994–1.017)	0.367
Other	320 (0.1%)	361 (0.1%)	1.191 (1.082–1.311)	< 0.001
Patient Refused	35 (0.0%)	34 (0.0%)	1.025 (0.755–1.392)	0.872
Unknown	4928 (1.6%)	4752 (1.6%)	1.018 (0.994–1.043)	0.148
Missing	1303 (0.4%)	949 (0.3%)	0.769 (0.718–0.824)	< 0.001
Insurance				
Private/Other	184266 (59.9%)	173854 (59.2%)	Reference	
Medicare	79047 (25.7%)	77416 (26.4%)	1.038 (1.031–1.045)	< 0.001
Medicaid	32267 (10.5%)	32996 (11.2%)	1.084 (1.072–1.095)	< 0.001
Self-Pay	734 (0.2%)	562 (0.2%)	0.812 (0.754–0.873)	< 0.001
Missing	11240 (3.7%)	8747 (3.0%)	0.825 (0.808–0.842)	< 0.001
Median Income by ZIP Code (x \$1,000), mean (SD)	55.5 (19.8)	55.3 (19.8)	0.994 (0.992–0.995)	< 0.001
Number Primary Care Visits				
1	146615 (47.7%)	146505 (49.9%)	Reference	
2	77577 (25.2%)	73147 (24.9%)	0.944 (0.932–0.955)	< 0.001
3	40406 (13.1%)	35907 (12.2%)	0.889 (0.876–0.903)	< 0.001
4+	42956 (14.0%)	38016 (12.9%)	0.886 (0.874–0.898)	< 0.001
Alcohol Use Disorder	7034 (2.3%)	7095 (2.4%)	1.058 (1.039–1.078)	< 0.001
Bipolar Disorder	5547 (1.8%)	5443 (1.9%)	1.029 (1.007–1.050)	0.008
Cannabis Use Disorder	2549 (0.8%)	2585 (0.9%)	1.063 (1.028–1.099)	< 0.001
Cocaine Stimulant Use Disorder	1272 (0.4%)	1294 (0.4%)	1.066 (1.020–1.114)	0.005
Generalized Anxiety Disorder	73483 (23.9%)	73554 (25.1%)	1.065 (1.058–1.072)	< 0.001
Hallucinogen Use Disorder	38 (0.0%)	50 (0.0%)	1.379 (1.023–1.858)	0.035
Sedative, Hypnotic or Anxiolytic Drug Use Disorder	167 (0.1%)	181 (0.1%)	1.136 (1.000–1.290)	0.051
Major Depressive Disorder	51385 (16.7%)	49885 (17.0%)	1.021 (1.013–1.028)	< 0.001

Obsessive Compulsive Disorder	1436 (0.5%)	1408 (0.5%)	1.027 (0.987–1.069)	0.182
Opioid Use Disorder	2613 (0.8%)	2495 (0.8%)	1.000 (0.972–1.029)	0.983
Other Psychoactive Use Disorder	2416 (0.8%)	2435 (0.8%)	1.056 (1.021–1.093)	0.002
Panic Disorder	5981 (1.9%)	5923 (2.0%)	1.038 (1.019–1.058)	< 0.001
Post-Traumatic Stress Disorder	5364 (1.7%)	5476 (1.9%)	1.071 (1.050–1.092)	< 0.001
Schizoaffective Disorder	705 (0.2%)	657 (0.2%)	0.976 (0.920–1.035)	0.423
Schizophrenia	1069 (0.3%)	1013 (0.3%)	0.993 (0.946–1.041)	0.764
Insomnia	15013 (4.9%)	14811 (5.0%)	1.035 (1.024–1.047)	< 0.001

*Odds ratios, 95% confidence intervals, and p-values are from single-predictor logistic regression models where the dependent variable was time period (post-lockdown vs. pre-lockdown) and generalized estimating equations were used to account for repeated measurements among patients who had primary care visits in both the pre-lockdown and post-lockdown periods.

Supplementary Table 3. Comparison of patient demographic and clinical characteristics among patients who were not prescribed a Z-drug pre-COVID (3/24/2019-12/31/2019) and either did or did not start a Z-drug after COVID began (3/24/2020-12/31/2020).

	Had Z-drug Prescription Between 3/24/2020-12/31/2020	Did Not Have Z-drug Prescription Between 3/24/2020-12/31/2020	P-value
N	1656	285298	
Age, mean (SD)	58.8 (14.5)	54.1 (18.0)	< 0.001
Gender			
Female	986 (59.5%)	159082 (55.8%)	0.161
Male	670 (40.5%)	126186 (44.2%)	
Nonbinary	0 (0.0%)	7 (0.0%)	
X	0 (0.0%)	10 (0.0%)	
Other	0 (0.0%)	3 (0.0%)	
Unknown	0 (0.0%)	10 (0.0%)	
Race			
White	1408 (85.0%)	221038 (77.5%)	0.002
Black	112 (6.8%)	35250 (12.4%)	
American Indian/Alaska Native	5 (0.3%)	461 (0.2%)	
Asian	24 (1.4%)	6977 (2.4%)	
Multiracial/Multicultural	35 (2.1%)	9410 (3.3%)	
Hispanic/Latino	0 (0.0%)	3 (0.0%)	
Native Hawaiian/Pacific Islander	0 (0.0%)	3 (0.0%)	
Other	3 (0.2%)	870 (0.3%)	
Unavailable	33 (2.0%)	4538 (1.6%)	
Declined	23 (1.4%)	3925 (1.4%)	
Unknown	13 (0.8%)	2823 (1.0%)	

Marital Status			
Married	976 (58.9%)	152994 (53.6%)	< 0.001
Domestic Partner	12 (0.7%)	1071 (0.4%)	
Single	373 (22.5%)	88885 (31.2%)	
Divorced	142 (8.6%)	19842 (7.0%)	
Legally Separated	19 (1.1%)	1645 (0.6%)	
Widowed	103 (6.2%)	14907 (5.2%)	
Other	2 (0.1%)	353 (0.1%)	
Patient Refused	0 (0.0%)	32 (0.0%)	
Unknown	24 (1.4%)	4636 (1.6%)	
Missing	5 (0.3%)	933 (0.3%)	
Insurance			
Private/Other	903 (54.5%)	169104 (59.3%)	< 0.001
Medicare	602 (36.4%)	74975 (26.3%)	
Medicaid	133 (8.0%)	32141 (11.3%)	
Self-Pay	1 (0.1%)	545 (0.2%)	
Missing	17 (1.0%)	8533 (3.0%)	
Median Income by ZIP Code (x \$1,000), mean (SD)	57.2 (20.7)	55.3 (19.8)	< 0.001
Number of Primary Care Visits			
Mean (SD)	2.5 (2.1)	2.0 (1.6)	< 0.001
1	652 (39.4%)	145169 (50.9%)	< 0.001
2	417 (25.2%)	70992 (24.9%)	
3	258 (15.6%)	34384 (12.1%)	
4+	329 (19.9%)	34753 (12.2%)	
Alcohol Use Disorder	40 (2.4%)	6875 (2.4%)	1.000
Bipolar Disorder	51 (3.1%)	5227 (1.8%)	< 0.001
Cannabis Use Disorder	13 (0.8%)	2520 (0.9%)	0.768
Cocaine Stimulant Use Disorder	10 (0.6%)	1254 (0.4%)	0.412
Generalized Anxiety Disorder	703 (42.5%)	70397 (24.7%)	< 0.001
Hallucinogen Use Disorder	0 (0.0%)	50 (0.0%)	1.000
Sedative, Hypnotic or Anxiolytic Drug Use Disorder	2 (0.1%)	166 (0.1%)	0.253
Major Depressive Disorder	386 (23.3%)	47885 (16.8%)	< 0.001
Obsessive Compulsive Disorder	7 (0.4%)	1370 (0.5%)	0.873
Opioid Use Disorder	19 (1.1%)	2338 (0.8%)	0.181
Other Psychoactive Use Disorder	16 (1.0%)	2352 (0.8%)	0.617
Panic Disorder	46 (2.8%)	5677 (2.0%)	0.028
Post-Traumatic Stress Disorder	48 (2.9%)	5242 (1.8%)	0.002
Schizoaffective Disorder	2 (0.1%)	642 (0.2%)	0.453
Schizophrenia	4 (0.2%)	993 (0.3%)	0.600
Insomnia	532 (32.1%)	12465 (4.4%)	< 0.001