

Using Big Data to Identify Risk Factors for Opioid Abuse Among Patients with Opioid Prescriptions

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BACKGROUND

According to CDC, there were nearly 72,000 Americans who died from drug overdoses in 2019, a 5% increase from 2018. Deaths from drug abuse continue to be high.

However, opioids are among the most important therapeutic medications for people with chronic diseases, chronic pain, or mental health disorders. Some studies showed that more than half of patients had an opioid prescription before their initial diagnosis of opioid overdose or opioid use disorders.

Therefore, it is critical to identify risk factors for opioid abuse among patients with opioid prescriptions, especially for patients who are prescribed opioids for the initial time.

SUBJECTS

The analytical dataset comprised information from IBM® MarketScan® database on privately insured individuals in the United States, from 2013 to 2017. The study estimated the opioid-related outcome models and identified risk factors for opioid abuse.

- Eligible population in the study: Patients who had opioid prescriptions.
- Opioid abuse outcomes:
 - Opioid overdose
 - Opioid use disorders
- Variables:
 - Patients' opioid prescription records: Morphine Milligram Equivalents (MME), opioid supply days
 - Comorbidity, Mental health disorders, and Joint replacement procedures.
 - Demographic variables (e.g., age, gender, health plan enrollment history) were records at the initial opioid prescription obtained.

METHODS

The univariate analysis of each variable was applied to determine if differences in opioid abuse diagnoses were statistically significant. Any variable having a significant univariate test at 0.05 level is selected as a candidate for the multivariate analysis.

Multivariate logistic regression was used to estimate the association between the selected predictors (socio-demographics, comorbidity, mental health disorder, joint replacement procedures, etc.) and opioid abuse diagnoses.

RESULTS

Table 1. Demographic Description for Patients with Overdose/Opioid Use Disorder (2013- 2017)

	Opioid Use Disorder		Overdose	
	Yes	No	Yes	No
Region				
Northeast Region	68	222,012	13	222,067
North Central Region	131	322,816	17	322,930
South Region	146	522,856	26	522,976
West Region	245	388,671	20	388,896
Unknown Region	11	36,624	0	36,635
Health Plan				
Commercial	506	1,304,252	59	1,304,699
Medicare	95	188,727	17	188,805
Sex				
Male	278	577,263	26	577,515
Female	323	915,716	50	915,989
Age Groups				
0-17 years	6	150,984	5	150,985
18-24 years	40	106,498	11	106,527
25-34 years	61	178,327	14	178,374
35-44 years	80	247,203	7	247,276
45-54 years	143	296,534	8	296,669
55-64 years	168	310,995	16	311,147
65+ years	103	202,438	15	202,526
Morphine Milligram Equivalents (MME)				
0-20	9559	480,052	356	489,255
21-50	19780	682,894	722	701,952
51-90	12653	152,411	382	164,682
91+	3528	74,867	167	78,228
Joint Replacement				
No	43278	1,350,313	1523	1,392,068
Yes	2242	39,911	104	42,049
Comorbidity Flag				
No	25820	1,000,721	647	1,025,894
Yes	18243	346,661	927	363,977
Mental Disorder				
No	26883	1,164,197	652	1,190,428
Yes	17180	183,185	922	199,443
Number of days supply for opioids				
0-3 days	5337	443,445	275	448,507
4-7 days	8080	480,513	340	488,253
8-15 days	7314	240,816	342	247,788
16-30 days	24013	206,074	643	229,444
31-60 days	324	6,181	7	6,498
61-90 days	448	12,982	20	13,410
90+ days	4	213		217
Age at Index Date (Mean)				
No	50	45	45	45
Number of days supply for opioids (Mean)				
No	25.2	14.3	26.3	14.3

Table 2. Summary Statistics for Univariate Regression Analysis (Dependent variable= Opioid Use Disorder)

Variables	Odds Ratio	95% CI	P-Value
Health Plan			
Commercial vs Medicare	1.45	1.34 1.56	<.0001
Age Group			
18-24 years vs 0-17 years	5.64	5.23 6.08	<.0001
25-34 years vs 0-17 years	5.94	5.52 6.38	<.0001
35-44 years vs 0-17 years	6.61	6.15 7.09	<.0001
45-54 years vs 0-17 years	6.50	6.05 6.97	<.0001
55-64 years vs 0-17 years	5.28	4.92 5.67	<.0001
65+ years vs 0-17 years	3.13	2.83 3.46	<.0001
Sex			
Female vs Male	0.82	0.81 0.83	<.0001
Geographical Region			
Northeast vs South	0.62	0.60 0.63	<.0001
North Central vs South	0.71	0.69 0.72	<.0001
West vs South	0.53	0.51 0.54	<.0001
Unknown vs South	0.99	0.93 1.05	0.6557
Had Joint Replacement			
Yes vs No	1.64	1.26 1.40	<.0001
At Least One Comorbidity			
Yes vs No	1.72	0.92 1.11	0.7794
At Least One Mental Disorder			
Yes vs No	4.12	0.85 0.93	<.0001
Opioids Medicine Supply Days			
4-7 days vs 0-3 days	1.46	1.43 1.50	<.0001
8-15 days vs 0-3 days	2.03	1.98 2.09	<.0001
16-30 days vs 0-3 days	4.52	4.40 4.65	<.0001
31-60 days vs 0-3 days	7.46	7.23 7.69	<.0001
61-90 days vs 0-3 days	3.95	3.20 4.87	<.0001
MME Group			
0-20 vs 21-50	0.44	1.69 1.75	<.0001
51-90 vs 21-50	1.72	4.05 4.18	<.0001
91+ vs 21-50	1.09	4.40 4.65	<.0001

RESULTS

Table 3. Summary Statistics for Univariate Regression Analysis (Dependent variable= Overdose)

Variables	Odds Ratio	95% CI	P-Value
Health Plan			
Commercial vs Medicare	0.64	0.48 0.86	0.0027
Age Group			
18-24 years vs 0-17 years	3.76	3.04 4.64	<.0001
25-34 years vs 0-17 years	1.73	1.39 2.15	<.0001
35-44 years vs 0-17 years	1.17	0.94 1.46	0.1523
45-54 years vs 0-17 years	1.25	1.01 1.55	0.0373
55-64 years vs 0-17 years	1.00	0.81 1.24	0.9936
65+ years vs 0-17 years	0.66	0.47 0.94	0.0212
Sex			
Female vs Male	0.87	0.81 0.94	0.0002
Geographical Region			
Northeast vs South	1.15	1.04 1.28	0.0096
North Central vs South	1.11	1.01 1.22	0.038
West vs South	0.98	0.88 1.09	0.6954
Unknown vs South	1.20	0.85 1.68	0.2955
Had Joint Replacement			
Yes vs No	2.32	2.00 2.70	<.0001
At Least One Comorbidity			
Yes vs No	2.68	2.48 2.90	<.0001
At Least One Mental Disorder			
Yes vs No	7.22	6.70 7.78	<.0001
Opioids Medicine Supply Days			
4-7 days vs 0-3 days	1.22	1.09 1.36	0.0007
8-15 days vs 0-3 days	1.68	1.49 1.89	<.0001
16-30 days vs 0-3 days	2.69	2.36 3.07	<.0001
31-60 days vs 0-3 days	2.83	2.40 3.33	<.0001
61-90 days vs 0-3 days	1.30	0.42 4.06	0.6517
MME Group			
0-20 vs 21-50	0.50	0.46 0.55	<.0001
51-90 vs 21-50	1.60	1.41 1.82	<.0001
91+ vs 21-50	1.53	1.30 1.81	<.0001

- Between 2013 and 2017, a total of 4,793,793 individuals received opioid prescriptions, of which 3,092 (0.06%) and 72,910 (1.52%) patients were diagnosed with opioid overdose and OUD after initial prescriptions respectively (Table 1).
- In Table 2-3, as the average MME for the opioid drug in prescription increased, the proportion diagnosed with opioid overdose/ OUD significantly decreased, in general.
- After adjusting for covariates, multiple logistic regressions showed that people aged 18-24 years were 3.8 times (95% CI:3.1-4.7) more likely to have opioid overdose than those under 18 years old, while 18-24 years were 5.6 times (95% CI:5.2-6.1) more likely to be OUD than those under 18 years old. Significantly, there was a tendency for this rate to decrease as age increased (p<.001).
- Women were about 10% less likely to opioid overdose/ OUD than men.
- Also, patients were significantly 2.3 times more likely to overdose opioids than patients who did not.
- Patients who had at least one comorbidity or at least one mental illness or patients who had joint replacement procedures were significantly more likely to overdose opioids/OUD than patients without these diagnoses, respectively.

CONCLUSIONS

This study analyzed risk factors for opioid overdose/opioid use disorder in patients with opioid prescriptions. The opioid medication prescription should take into account individuals at high risk for opioid overdose/opioid use disorder.