

Supplementary Appendix for the article

Injectable naltrexone, oral naltrexone, and buprenorphine/naloxone utilization and discontinuation among individuals treated for opioid use disorder in a United States commercially insured population

MORGAN Jake R., MS¹

SCHACKMAN Bruce R., PhD²

LEFF Jared A., MS²

LINAS Benjamin P., MD, MPH^{1,3}

WALLEY Alexander Y., MD, MSc⁴

Department of Medicine, Section of Infectious Diseases, Boston Medical Center,¹ Boston, MA, USA;

Department of Healthcare Policy & Research, Weill Cornell Medical College,² New York, NY, USA;

Department of Epidemiology, Boston University School of Public Health,³ Boston, MA, USA;

Department of Medicine, Section of General Internal Medicine, Boston Medical Center,⁴ Boston, MA, USA

Supplemental Table 1: NDC codes for OUD treatment

OUD treatment	NDC Codes			
Injectable naltrexone	65757-0300-01			
Oral naltrexone	52372-0751-01	62991-1243-01	00185-0039-01	
	52372-0751-03	62991-1243-04	49452-4835-01	
	52372-0751-02	62991-1243-02	49452-4835-05	
	54868-5574-00	63370-0158-25	49452-4835-03	
	16729-0081-01	63370-0158-10	49452-4835-02	
	16729-0081-10	63370-0158-35	47335-0326-88	
	52152-0105-02	63370-0158-15	47335-0326-83	
	52152-0105-30	00406-1170-01	51224-0206-30	
	68084-0291-11	00406-1170-03	51224-0206-50	
	68084-0291-21	38779-0887-04	00555-0902-02	
	52152-0105-04	38779-0887-08	00555-0902-01	
	42291-0632-30	38779-0887-05	50436-0105-01	
	63275-9901-01	38779-0887-06	00056-0011-30	
	63275-9901-03	38779-0887-03	00056-0011-70	
	63275-9901-02	43063-0591-15	00056-0011-22	
	63275-9901-05	68094-0853-62	00056-0079-50	
	63275-9901-04	51927-3602-00	51285-0275-01	
	68115-0680-30	51927-2753-00	51285-0275-02	
	65694-0100-10	51927-4377-00	00056-0080-50	
	65694-0100-03	00185-0039-30	62991-1243-03	
	Buprenorphine/naloxone	54569-6408-00	63629-4034-03	54868-5707-04
		00228-3154-03	63629-4034-02	54868-5707-01
		00228-3155-03	63629-4034-01	54868-5707-02
00228-3154-73		55887-0312-04	54868-5707-03	
00228-3155-73		55887-0312-15	54868-5707-00	
53217-0138-30		55045-3784-03	54868-5750-00	
65162-0416-03		68258-2999-03	35356-0004-07	
65162-0415-03		66336-0015-30	55700-0147-30	
42291-0175-30		66336-0016-30	35356-0004-30	
42291-0174-30		12496-1202-03	49999-0395-30	
60429-0587-30		12496-1208-03	49999-0395-15	
60429-0586-30		12496-1208-01	49999-0395-07	
50383-0287-93		12496-1202-01	12496-1283-02	
50383-0294-93		12496-1204-03	12496-1306-02	
00406-1924-03		12496-1212-01	00490-0051-60	
00406-1923-03		12496-1212-03	00490-0051-30	
55700-0184-30		12496-1204-01	00490-0051-90	
00093-5721-56		68071-1510-03	00490-0051-00	
00093-5720-56		68071-1380-03	16590-0666-30	
00054-0188-13		23490-9270-09	16590-0667-90	
00054-0189-13		23490-9270-06	16590-0667-05	
54569-6399-00		23490-9270-03	16590-0667-30	
54569-5496-00		43063-0184-07	16590-0666-05	
54569-5739-01		43063-0184-30	54123-0986-30	
54569-5739-00		52959-0749-30	54123-0929-30	
54569-5739-02		52959-0304-30	54123-0114-30	
63874-1084-03		54123-0914-30	54123-0957-30	
63874-1085-03				

NDC = national drug code; OUD = opioid use disorder

Supplemental Table 2: ICD-9 codes identifying substance use disorder

Substance use disorder diagnoses	ICD-9 Code	ICD-9 code description
Opioid	304.00	Opioid type dependence, unspecified
Opioid	304.01	Opioid type dependence, continuous
Opioid	304.02	Opioid type dependence, episodic
Opioid	304.03	Opioid type dependence, in remission
Opioid	304.70	Combinations of opioid type drug with any other drug dependence, unspecified
Opioid	304.71	Combinations of opioid type drug with any other drug dependence, continuous
Opioid	304.72	Combinations of opioid type drug with any other drug dependence, episodic
Opioid	304.73	Combinations of opioid type drug with any other drug dependence, in remission
Opioid	305.50	Opioid abuse, unspecified
Opioid	305.51	Opioid abuse, continuous
Opioid	305.52	Opioid abuse, episodic
Opioid	305.53	Opioid abuse, in remission
Alcohol	265.20	Pellagra
Alcohol	291.1	Alcohol-induced persisting amnestic disorder
Alcohol	291.2	Alcohol-induced persisting dementia
Alcohol	291.3	Alcohol-induced psychotic disorder with hallucinations
Alcohol	291.4	Idiosyncratic alcohol intoxication
Alcohol	291.5	Alcohol-induced psychotic disorder with delusions
Alcohol	291.89	Other alcohol-induced mental disorders
Alcohol	303.00	Acute alcoholic intoxication in alcoholism, unspecified
Alcohol	303.01	Acute alcoholic intoxication in alcoholism, continuous
Alcohol	303.02	Acute alcoholic intoxication in alcoholism, episodic
Alcohol	303.03	Acute alcoholic intoxication in alcoholism, in remission
Alcohol	303.90	Other and unspecified alcohol dependence, unspecified
Alcohol	303.91	Other and unspecified alcohol dependence, continuous
Alcohol	303.92	Other and unspecified alcohol dependence, episodic
Alcohol	303.93	Other and unspecified alcohol dependence, in remission
Alcohol	305.00	Alcohol abuse, unspecified
Alcohol	305.01	Alcohol abuse, continuous
Alcohol	305.02	Alcohol abuse, episodic
Alcohol	305.03	Alcohol abuse, in remission
Alcohol	357.5	Alcoholic polyneuropathy
Alcohol	425.5	Alcoholic cardiomyopathy
Alcohol	535.30	Alcoholic gastritis, without mention of hemorrhage
Alcohol	535.31	Alcoholic gastritis, with hemorrhage
Alcohol	571.0	Alcoholic fatty liver
Alcohol	571.1	Acute alcoholic hepatitis
Alcohol	571.2	Alcoholic cirrhosis of liver

Alcohol	571.3	Alcoholic liver damage, unspecified
Alcohol	980.0	Toxic effect of ethyl alcohol
Alcohol	980.1	Toxic effect of methyl alcohol
Alcohol	980.2	Toxic effect of isopropyl alcohol
Alcohol	980.3	Toxic effect of fusel oil
Alcohol	980.8	Toxic effect of other specified alcohols
Alcohol	980.9	Toxic effect of unspecified alcohol
Alcohol	V113	Personal history of alcoholism
Amphetamine	304.40	Amphetamine and other psychostimulant dependence, unspecified
Amphetamine	304.41	Amphetamine and other psychostimulant dependence, continuous
Amphetamine	304.42	Amphetamine and other psychostimulant dependence, episodic
Amphetamine	304.43	Amphetamine and other psychostimulant dependence, in remission
Amphetamine	305.70	Amphetamine or related acting sympathomimetic abuse, unspecified
Amphetamine	305.71	Amphetamine or related acting sympathomimetic abuse, continuous
Amphetamine	305.72	Amphetamine or related acting sympathomimetic abuse, episodic
Amphetamine	305.73	Amphetamine or related acting sympathomimetic abuse, in remission
Antidepressant	305.80	Antidepressant type abuse, unspecified
Antidepressant	305.81	Antidepressant type abuse, continuous
Antidepressant	305.82	Antidepressant type abuse, episodic
Antidepressant	305.83	Antidepressant type abuse, in remission
Cannabis	304.30	Cannabis dependence, unspecified
Cannabis	304.31	Cannabis dependence, continuous
Cannabis	304.32	Cannabis dependence, episodic
Cannabis	304.33	Cannabis dependence, in remission
Cannabis	305.20	Cannabis abuse, unspecified
Cannabis	305.21	Cannabis abuse, continuous
Cannabis	305.22	Cannabis abuse, episodic
Cannabis	305.23	Cannabis abuse, in remission
Cocaine	304.20	Cocaine dependence, unspecified
Cocaine	304.21	Cocaine dependence, continuous
Cocaine	304.22	Cocaine dependence, episodic
Cocaine	304.23	Cocaine dependence, in remission
Cocaine	305.60	Cocaine abuse, unspecified
Cocaine	305.61	Cocaine abuse, continuous
Cocaine	305.61	Cocaine abuse, episodic
Cocaine	305.63	Cocaine abuse, in remission
Hallucinogen	304.50	Hallucinogen dependence, unspecified
Hallucinogen	304.51	Hallucinogen dependence, continuous
Hallucinogen	304.52	Hallucinogen dependence, episodic
Hallucinogen	304.53	Hallucinogen dependence, in remission
Hallucinogen	305.30	Hallucinogen abuse, unspecified
Hallucinogen	305.31	Hallucinogen abuse, continuous
Hallucinogen	305.32	Hallucinogen abuse, episodic
Hallucinogen	305.33	Hallucinogen abuse, in remission
Sedative	304.10	Sedative, hypnotic or anxiolytic dependence, unspecified

Sedative	304.11	Sedative, hypnotic or anxiolytic dependence, continuous
Sedative	304.12	Sedative, hypnotic or anxiolytic dependence, episodic
Sedative	304.13	Sedative, hypnotic or anxiolytic dependence, in remission
Sedative	305.40	Sedative, hypnotic or anxiolytic abuse, unspecified
Sedative	305.41	Sedative, hypnotic or anxiolytic abuse, continuous
Sedative	305.42	Sedative, hypnotic or anxiolytic abuse, episodic
Sedative	305.43	Sedative, hypnotic or anxiolytic abuse, in remission

Supplemental Table 3: Logistic regression predicting OUD-treatment among OUD-diagnosed individuals

Parameter	Adjusted Odds Ratio	95% Confidence Interval
<i>Sex</i>		
Male		Reference
Female	0.866	0.845 - 0.886
<i>Age</i>		
Less than 30	1.805	1.762 - 1.850
30 or older		Reference
<i>Regions</i>		
Northeast		Reference
Midwest	1.269	1.226 - 1.313
South	1.038	1.006 - 1.071
West	1.056	1.018 - 1.096
Unknown	1.185	1.105 - 1.270
<i>Health plan types</i>		
PPO		Reference
HMO	1.140	1.098 - 1.184
POS	1.106	1.054 - 1.161
Other	0.958	0.93 - 0.986
<i>Substance codes</i>		
Alcohol	1.255	1.167 - 1.351
Amphetamines	1.218	1.159 - 1.281
Antidepressants	1.171	0.936 - 1.463
Cannabis	1.247	1.206 - 1.289
Cocaine	1.352	1.298 - 1.409
Hallucinogens	0.894	0.797 - 1.002
Sedative	1.603	1.552 - 1.656

OUD = opioid use disorder; HMO = health maintenance organization; PPO = preferred provider organization; POS = point of service

Supplemental Table 4: Full cox model results

Parameter	Hazard Ratio	95% CI	p-value
<i>Medication at initiation</i>			
Injectable naltrexone > 30 days	2.63	2.48-2.80	<0.001
Oral naltrexone >30 days	2.70	2.60-2.80	<0.001
Buprenorphine/naloxone		Reference	
<i>Medication at initiation control</i>			
Injectable naltrexone ≤ 30 days	0.03	0.02-0.04	<0.001
Oral naltrexone ≤ 30 days	0.19	0.17-0.20	<0.001
<i>Age at initiation</i>			
Younger than 30	1.27	1.24-1.3	<0.001
30 or older		Reference	
<i>Sex</i>			
Male		Reference	
Female	1.05	1.02-1.07	<0.001
<i>Polysubstance codes</i>			
Alcohol	1.16	1.09-1.24	<0.001
Amphetamines	1.03	0.99-1.08	0.153
Antidepressants	1.14	0.94-1.38	0.199
Cannabis	1.09	1.06-1.13	<0.001
Cocaine	1.10	1.06-1.14	<0.001
Hallucinogens	1.07	0.97-1.19	0.182
Sedative	1.13	1.10-1.16	<0.001
<i>Ever seen in detox facility</i>			
Yes	0.88	0.86-0.91	<0.001
No		Reference	
<i>Provider at initiation (indicators)</i>			
Internal medicine	0.99	0.96-1.02	0.497
Family practice	0.92	0.89-0.95	<0.001
Pediatrics	0.88	0.77-1.00	0.051
Psychiatry	0.94	0.91-0.97	<0.001
Obstetrics and Gynecology	1.03	0.91-1.16	0.649
Surgery	1.13	0.99-1.29	0.074
<i>Place of initiation (indicators)</i>			
Office visit	0.94	0.91-0.97	<0.001
Outpatient clinic	1.08	1.05-1.12	<0.001
ER	1.24	1.15-1.35	<0.001
Inpatient	1.23	1.14-1.32	<0.001
<i>Region (reference Northeast)</i>			
Midwest	1.07	1.02-1.10	<0.001
South	1.06	1.03-1.10	<0.001
West	1.25	1.21-1.30	<0.001
Unknown	0.72	0.67-0.78	<0.001
<i>Insurance (reference PPO)</i>			

Parameter	Hazard Ratio	95% CI	p-value
HMO	1.06	1.02-1.10	0.001
POS	0.97	0.93-1.02	0.229
Other Insurance	1.03	1.00-1.06	0.036

CI = confidence interval; ER = emergency room; HMO = health maintenance organization; PPO = preferred provider organization; POS = point of service