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Chronic Pain among Patients with Opioid Use Disorder: Results from Electronic Health Records Data

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Abstract

Purpose—To examine the prevalence of comorbid chronic pain among patients with opioid use disorder (OUD) and to compare other comorbidities (substance use disorder [SUD], mental health disorders, health/disease conditions) among patients in four categories: no chronic pain (No Pain), OUD prior to pain (OUD First), OUD and pain at the same time (Same Time), or pain condition prior to OUD (Pain First).

Methods—Using an electronic health record (EHR) database from 2006–2015, the study assessed 5,307 adult patients with OUD in a large healthcare system; 35.6% were No Pain, 9.7% were OUD First, 14.9% were Same Time, and 39.8% were Pain First.

Results—Most OUD patients (64.4%) had chronic pain conditions, and among them 61.8% had chronic pain before their first OUD diagnosis. Other SUDs occurred more frequently among OUD First patients than among other groups in terms of alcohol (33.4% vs. 25.4% for No Pain, 20.7% for Same Time, and 20.3% for Pain First), cocaine (19.0%, vs. 13.8%, 9.4%, 7.1%), and alcohol or drug-induced disorders. OUD First patients also had the highest rates of HIV (4.7%) and hepatitis C virus (HCV; 28.2%) among the four groups. Pain First patients had the highest rates of mental disorder (81.7%), heart disease (72.0%), respiratory disease (68.4%), sleep disorder (41.8%), cancer (23.4%), and diabetes (19.3%).

Conclusions—The alarming high rates of chronic pain conditions occurring before OUD and the associated severe mental health and physical health conditions require better models of assessment and coordinated care plans to address these complex medical conditions.

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Introduction

Opioid use disorder (OUD) is associated with excess mortality, morbidities, and other adverse health and social conditions (Degenhardt et al., 2013; Hser, Evans, Grella, Ling, & Anglin, 2015). OUD is common among individuals with chronic pain conditions, and chronic pain is common among individuals with OUD (Ilgen, Perron, Czyz, McMammon, & Trafton, 2010; Larson et al., 2007; Rosenblum et al., 2003). The relationship between chronic pain and OUD and the time course of the two is complex; chronic pain may precede prescription opioid use and addiction or may develop after OUD, either as an expected health condition or as a consequence of OUD. Substance use is a risk factor for car accidents and violent crime, which often lead to injuries that are associated with chronic pain (Cherpitel, 1999; Goldstick et al., 2016; Movig et al., 2004). On the other hand, individuals with chronic pain often take opioids to relieve pain, and opioid therapy is the most commonly prescribed treatment for severe chronic pain, even though long-term opioid therapy remains controversial for chronic non-cancer pain due to its questionable efficacy and association with opioid misuse and use disorders in some individuals.

Complicating the issue is that other physical health and mental health problems often co-occur with OUD and chronic pain. For example, OUD patients are up to 11 times more likely than the general population to have a mood disorder, and they have up to 8 times greater rates of anxiety disorders (Brooner, King, Kidorf, Schmidt, & Bigelow, 1997; Conway, Compton, Stinson, & Grant, 2006). Individuals with depression, schizophrenia, and bipolar disorder are significantly more likely to have chronic pain (Odds Ratio of 2.61, 1.21 and 2.17, respectively) relative to those without these psychiatric conditions (Birgenheir et al., 2013). The overlapping risk factors and causes of these diseases and chronic conditions are difficult to disentangle. Optimizing treatment for patients with these complex medical conditions has become a nationally recognized target for healthcare improvement (Thomas et al., 2015; Volkow & McLellan, 2011).

There is limited knowledge about chronic pain conditions, other co-morbid health and mental health conditions, and healthcare utilization among OUD patients treated in general medical or healthcare systems. Most knowledge of OUD is based on self-reports from individuals treated in publicly funded addiction specialty programs. The availability of electronic health records (EHRs) provides the opportunity to efficiently examine the health status and service use among large and diverse samples in general healthcare systems (Ghitza, Gore-Langton, Lindblad, & Tai, 2015; Tai et al., 2014; Tai, Wu, & Clark, 2012; Weil, 2014). This is particularly important because the nonmedical use of prescription opioids is now recognized to be a national epidemic in the United States, making prescription opioid misuse and overdose deaths a critical public health problem (Manchikanti et al., 2012). EHR systems represent a new but underutilized research resource that allows OUD and related physical and mental health conditions to be studied in general healthcare systems.

The goal of this study was to examine chronic pain among patients with OUD, as well as to examine other substance use disorders, health, mental health, and treatment for health and mental health among patients in medical settings using EHRs. We divided our sample into

four clinically relevant groups related to the intersection and time course of OUD and chronic pain diagnoses: those with no chronic pain (No Pain group, or OUD-only group), those with chronic pain after OUD (i.e., OUD First group), those having both at the same time or clinic visit (i.e., Same Time group), and those with chronic pain before OUD (i.e., Pain First group). By comparing the four groups, we can examine the association between presence of chronic pain conditions and other psychiatric and medical conditions, as well as the prevalence of these conditions in association with the order of first pain diagnosis versus first OUD diagnosis. Based on previous research, we hypothesized that chronic pain conditions in OUD patients would be associated with greater prevalence of mental health disorders and physical health conditions than that among OUD patients without chronic pain diagnoses; the OUD-only group however, would have greater prevalence of other substance use disorders than OUD patients with chronic pain conditions. Further, we hypothesized that people in the OUD First group would have higher rates of other substance use disorders, mental health problems, and physical health problems than individuals in the Pain First group but similar prevalence rates of other substance use disorders as those in the Same Time group. Findings are important to extend knowledge of relative differences in psychiatric and medical comorbidities among patients with OUD and chronic pain in order to inform clinical practice related to screening patients with these commonly related conditions and targeting treatment interventions for them.

Methods

This study used health record data from a healthcare system utilizing Epic software. On average, each patient had a history of clinical records (starting from first encounter or visit to last encounter) covering a span of 1,959 days (SD = 1,881 days) over 10 years from 2006 to 2015. The mean length of time from their first visit to their first pain diagnosis was 1,086 days (SD = 1,362), and to their first OUD diagnosis was 1,209 days (SD = 1,579).

These records contain data on patient demographics, clinical diagnoses, encounters, prescribed medications, and laboratory tests. The UCLA Institutional Review Board approved this project.

Study Sample

We identified eligible patients age 18 and older with an OUD diagnosis (abuse or dependence using International Classifications of Diseases [ICD]-9th Edition-CM codes 304.0x, 304.7x, or 305.5x) during an inpatient or outpatient visit during 2006–2015. The four groups were determined by the presence and the order of their first diagnosis of OUD and a pain condition. The mean length of time for the Pain First group from their first pain diagnosis to their OUD diagnosis was 983 days (SD=934), and the length of time for the OUD First group from their first OUD diagnosis to their pain diagnosis was 594 days (SD = 704).

Measures

Sociodemographic variables included: sex, race, age (standardized at Year 2015), employment, and health insurance. Clinical variables were defined from ICD-9 diagnoses

for pain-related conditions, psychiatric and mental health conditions, and physical health diagnoses or diseases. For each of these domains, ICD-9 codes were determined by an extensive review of the literature providing relevant ICD-9 codes, searching and confirming with documents provided by the Centers for Medicare & Medicaid Services (CMS), and expert reviews. The lists of ICD-9-CM codes utilized in this study can be found in the supplemental table.

Chronic pain—Codes for conditions that cause chronic pain follow the list provided by the Centers for Disease Control and Prevention (CDC, 2013). Examples of major chronic pain conditions include spinal pain, joint pain, generic chronic pain, osteoarthritis, and migraine.

Substance use disorder includes dependence on tobacco, and both abuse and dependence on alcohol, cannabis, amphetamine, cocaine, hallucinogens, sedatives/hypnotics/anxiolytics, and other drugs.

Health or disease diagnoses—Major diseases include heart disease/hypertension/stroke, respiratory disease, sleep disorder, liver disease, cancer, diabetes, sexually transmitted diseases (STDs), HIV, and HCV.

Psychiatric diagnoses—Mental disorders include psychotic disorders, bipolar disorder, depressive disorder, anxiety disorder, and other mental disorders (excluding those induced by alcohol or drugs, which are reported separately).

Length of observation—The length of observation was calculated by subtracting the date of the patient's first visit from the date of their last visit.

Statistical Analysis

We conducted t-tests (for continuous variables) and chi-square tests (for categorical variables) to examine group differences on demographics. Given that the four groups differed significantly in age, race, and gender, these measures were included in subsequent analyses as controls. To avoid potential bias due to differential observation periods by the four groups, the length of observation (first visit to last visit, as indicated by the records) was also included as an additional control variable. Separate multinomial logistic regression analyses were conducted for each diagnostic measure to test group differences (using the No Pain group as the reference), controlling for age, race, gender, and length of observation. When group difference was significant (indicated by an * for $p < .05$, ** for $p < 0.01$), linear tests on equivalence of coefficients between a pair of groups were conducted ($p < 0.05$). Analyses were conducted using SAS 9.4.

Results

Patient characteristics

The study cohort included 5,307 patients who had OUD, out of the 4.6 million patients in the system. More than two-thirds (64.4%) of these OUD patients also had a chronic pain condition, with the majority (61.8%) having chronic pain before OUD. Most study patients were male, white, and most had private insurance or paid for care themselves (Table 1).

Relative to the other groups, patients in the No Pain group were younger, fewer were employed, and more paid for care.

Chronic pain conditions

For the groups with chronic pain, major pain diagnoses included spinal pain, joint pain, general or unspecific chronic pain, osteoarthritis, and migraine (see Table 2). The prevalence rates in all these diagnoses were significantly different among the three groups with chronic pain ($p < .01$), and these rates were higher among the Pain First group than among the OUD First or Same Time groups ($p < .05$).

Co-morbid substance use disorder and psychiatric diagnoses

In terms of other substance use disorders, the four groups differed significantly ($p < 0.01$) in all substances examined except for sedative/hypnotic/anxiolytic use disorder (see Table 2). The OUD First group had the highest prevalence rates of alcohol, cocaine, and other drug use (e.g., inhalants and phencyclidine). This group also had the highest rates of alcohol- or drug-induced disorders. The No Pain group had the highest rate of amphetamine use and the lowest rate of tobacco use. The highest rate of sedative/hypnotic/anxiolytic use but lowest rates of alcohol, cannabis, amphetamine, cocaine, and hallucinogen use disorders were found in the Pain First group and the Same Time group.

Approximately 70% of the sample had a co-morbid mental health disorder, and the four groups also significantly differed in prevalence of any mental disorder or each specific type of mental disorder ($p < 0.01$) with only one exception, psychotic disorder. In general, the three groups with chronic pain conditions had higher rates of mental disorders in comparison to the No Pain group. Even among the No Pain group, more than 50% had co-morbid psychiatric diagnoses. Approximately half of each of the groups with chronic pain suffered from a depressive disorder, 40% had an anxiety disorder, and 40% had mental disorders other than psychosis, depression, anxiety, or bipolar disorders, with the highest rates consistently among the Pain First group.

Co-morbid health conditions, HIV, and HCV

Physical health and other disease conditions of the groups are listed in Table 3. The four groups were significantly different in all conditions examined ($p < 0.01$), except for STD and active HIV. Relative to OUD patients without chronic pain conditions, groups with chronic pain (particularly the Pain First group) also demonstrated higher rates of physical health conditions or diseases, including heart disease (72.0% in Pain First group vs. 26.8% in No Pain group vs. 59.6% in OUD First group vs. 57.2% in Same Time group), respiratory disease (68.4% vs. 23.7% vs. 58.1% vs. 48.2%), sleep disorder (41.8% vs. 6.7% vs. 21.4% vs. 15.7%), liver diseases (15.9% vs. 14.1% vs. 24.5% vs. 15.1%), cancer (23.4% vs. 9.0% vs. 16.9% vs. 11.3%), and diabetes (19.3% vs. 6.6% vs. 16.1% vs. 13.1%).

Among the four groups, the OUD First group had the highest HIV rate (4.7%), with the other two groups having a similar rate (1.7–2.7%). The OUD First group also showed the highest rate of HCV (28.2%), followed by the No Pain group (17.8%), Same Time group (16.1%), and the Pain First group (15.8%).

Discussion

This study adds to a rapidly growing knowledge base concerning the intersection of chronic pain and opioid use disorder occurring in a large healthcare organization. The results show that the majority of patients with opioid use disorder developed this disorder following the presence of chronic pain. A plausible explanation for some of these cases, although not directly demonstrated by the data collected, is iatrogenic causation via use of opioid medication prescriptions for pain. As hypothesized, this group, as well as the OUD First group and Same Time group, had greater rates of co-occurring psychiatric and medical conditions compared to the No Pain group. Patients with mental health and multiple pain problems often present with more physical and psychological distress, resulting in greater frequency of opioid prescribing in primary care practices (Edland et al., 2010). Some unexpected, though not totally surprising, differences emerged between the OUD First and Pain First groups. The OUD First group generally had higher rates of other substance use disorders, commensurate with rates in the No Pain group. This was not unanticipated, as both groups were early-identified addiction patients and may have more genetic and environmental predisposition to developing substance use disorders than did the Pain First Group. The Pain First group had generally higher rates of co-occurring medical problems than did the OUD First group. Part of the explanation for this phenomenon may be related to the age of the Pain First group; that group was older and thus more prone to medical illness. It may also be possible that the Pain First group had a longer duration of pain, which contributed to declining health status.

Several limitations should be considered when interpreting the results of this study. This was a study using medical record data. As in any research that uses data from medical records, variation in physician documentation and health insurance requirements may introduce bias in the data that are captured. The clinical data were initially recorded for clinical reasons and not specifically for research purposes, so the accuracy of the data may be less than that collected for research purposes. Further, as in other records-based research, we do not have the information about patient diagnoses outside the system in our study and therefore are unable to ascertain the new OUD diagnosis except that it's the first OUD diagnosis in the healthcare system under study. Participants were predominantly white patients living in the Los Angeles area of the United States, potentially limiting generalizability to patients in other regions. Our findings are dependent on the extent, accuracy, and validity of the data available in the EHR dataset. For example, because OUD diagnosis information was obtained from the EHR, we were not able to distinguish if prescription or nonprescription opioids were used or the route of administration. Both mislabeling of people who do not actually have OUD and under-recognition of true OUD diagnoses could affect the true prevalence of OUD in the sample. Since addiction can be under-recognized in the EHR, it is possible that a subset of patients may not have been identified as having an OUD; thus, there may be some patients in the Pain First group that may actually belong in the OUD First group.

Despite these limitations, the study revealed some important findings. As would be expected, the majority of patients (76.4%) in this general healthcare or medical setting were white and with private insurance or the resources to pay for their healthcare, as opposed to

being black or members of Hispanic ethnic minorities, and without health insurance, who are more often treated in the public treatment system in Los Angeles. Nevertheless, comorbidities are common among patients in both settings. Somewhat surprising is that the rates of co-occurring chronic pain conditions (64.4%) and mental disorders (70.9%) appear even higher than most rates reported in the literature in connection with OUD, often heroin use disorder, treated in public settings. However, medical conditions among OUD patients treated in publicly funded programs are mostly based on self-report, whereas the present study allowed the delineation of the specific rates of several major co-morbid physical health and other disease diagnoses among OUD patients in a general medical setting. This study demonstrated that regardless of demographic differences, OUD is similarly associated with high (or even higher) morbidity among patients in the private sector as in the public sector, which put them at high risk for mortality.

The Pain First group demonstrated the highest rates of physical and mental health problems. As discussed earlier, opioid prescriptions for pain in some of these individuals could have increased the risk for OUD and related problems. On the other hand, because screening for drug use is not mandated in primary care and some other medical settings, OUD may not be recognized and treated until very late in the addiction course, exacerbating the negative consequences of the disorder. Regardless of the potential causes, expanding training for medical professionals to improve screening, early intervention, support, and monitoring could prevent some of the excess morbidity associated with OUD. Furthermore, implementation of recent CDC guidelines addressing opioid prescribing for chronic non-cancer pain may provide additional risk mitigation in patients with chronic pain prior to their development of OUD (Dowell et al., 2016).

Comorbid OUD and chronic pain complicates treatment decision-making, predicts poor outcomes, and increases healthcare costs (Trafton, Oliva, Horst, Minekl, & Humphreys, 2004). Similarly, studies of healthcare claims data reveal that the most challenging and costliest OUD patients had high rates of preexisting and concurrent medical comorbidities and mental health disorders (Shei et al., 2015). The present study reveals the type and extent of comorbidities among OUD patients, results that support improving clinical practice by addressing the complex treatment needs in this population. Finally, studies utilizing the EHR data of patient populations with substance use disorders are important in identifying the scope of the problem and the extent of medical, mental health, and substance use comorbidities that necessitate better models of assessment and coordinated care plans.

Conclusion

The high rates of OUD co-occurring with other substance use disorders, chronic pain, and medical and mental health conditions underscore the need for improved assessments for these complex comorbidities, ongoing monitoring of OUD, and coordinated well-targeted interventions.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Highlights

1. Opioid use disordered patients commonly have chronic pain conditions, and most had chronic pain before their first opioid use disorder diagnosis.
2. Patients who had chronic pain condition before opioid use disorder had higher rates of co-morbid mental disorder and other health conditions, relative to those without chronic pain or whose chronic pain occurred after opioid use disorder
3. Patients who had opioid use disorder first were more likely to also have other substance use disorders.

Table 1

Sociodemographic characteristics

	No Pain n= 1,889	ODU First n= 515	Same Time n= 789	Pain First n=2,114	TOTAL n= 5,307
Age (mean)***	42.2	48.1	51.5	53.3	48.6
Female (%)***	34.8	33.0	47.3	50.2	42.6
Ethnicity/race (%)***					
White	71.5	79.3	79.1	79.0	76.4
Black	3.7	7.0	8.2	8.9	6.8
Hispanic	2.8	3.5	2.4	3.1	2.9
Asian	1.6	2.0	1.4	2.3	1.9
Others	20.4	8.2	4.0	3.6	12.0
Employment (%)***					
Employed	8.7	16.5	9.3	15.9	12.4
Not employed	20.7	39.2	34.2	52.6	37.2
Student	3.1	3.7	0.9	2.7	2.7
Unknown	67.6	40.6	55.6	28.8	47.7
Financial sources***					
Medicare	6.1	18.6	18.4	27.1	17.5
MediCal	6.3	12.4	7.2	10.5	8.7
Commercial	19.2	27.4	17.5	22.8	21.2
Self-pay/other	67.6	38.1	54.4	27.7	46.8
UCLA managed care	0.9	3.5	2.5	12.1	5.8

* p<.05,

** p<.01,

*** p<.001

Table 2

Pain conditions, other substance use disorders, and mental disorders (%)

	No Pain n= 1,889	OD First n= 515	Same Time n= 789	Pain First n=2,114	TOTAL n= 5,307
<i>Main pain conditions</i>					
Spinal pain**., bd, cd	0.0	45.1	42.0	75.0	40.5
Joint pain**., bc, bd, cd	0.0	37.7	25.5	61.6	32.0
General chronic pain**., bc, bd, cd	0.0	18.8	29.7	45.2	24.2
Osteoarthritis**., bc, bd, cd	0.0	9.3	12.6	36.4	17.3
Migraine**., bc., bd	0.0	8.2	12.4	18.8	10.1
<i>Substance use disorders</i>					
Tobacco use disorder**., ab, ac, ad	11.5	24.9	17.9	25.0	19.1
Alcohol use disorder**., ac, ad, bc, bd	25.4	33.4	20.7	20.3	23.4
Cannabis use disorder**., ac, ad, bd	14.3	14.6	8.2	8.1	11.0
Amphetamine use disorder**., ab, ac, ad, bc, bd	28.3	21.0	9.5	8.4	16.9
Cocaine use disorder**., ac, ad, bc, bd, cd	13.8	19.0	9.4	7.1	11.0
Hallucinogen use disorder**., ac, ad, bc, bd	3.9	3.1	0.6	0.6	2.0
Sedative, hypnotic, or Anxiolytic use disorder	11.2	14.4	15.3	15.1	13.7
Other Drug use disorder**., ab, ac, ad, bc, bd	17.8	36.7	20.2	23.1	22.1
Alcohol-induced Disorders**., ab, ac	2.9	5.6	4.7	4.8	4.2
Drug-induced Disorders**., ab, ac, ad	18.7	26.8	22.1	22.8	21.6
<i>Mental disorders</i>					
Any mental disorder**., ab, ac, ad, bd	57.8	74.4	70.7	81.7	70.9
Psychotic disorder	9.6	14.4	9.4	11.9	10.9
Bipolar disorder**., ab, ac, bd, cd	11.2	19.0	13.3	13.1	13.0
Depression disorder**., ab, ac, ad	37.2	54.6	49.3	63.5	51.2
Anxiety disorder**., ab, ac, ad, bd, cd	24.9	41.8	30.7	53.9	39.0
Other mental disorder**., ab, ac, ad	28.4	41.9	38.0	46.1	38.2

The group effect on each outcome variable was tested in the logistic model controlling for age, gender, ethnicity (white vs. non-white), and length of observation. A significant overall group effect is indicated by * for p<0.05 and ** for p<0.01. Significant linear tests (i.e., p<0.05) on equivalence of each pair of coefficients between No Pain (a), OUD first (b), OUD and Chronic Pain at the same time (c), and Pain first (d) are indicated by the respective groups in each pair.

Table 3

Physical health and other disease diagnosis (%)

	No Pain n= 1,889	ODD First n= 515	Same Time n= 789	Pain First n=2,114	TOTAL n= 5,307
Heart disease** _{ab, ac, ad, bd, cd}	26.8	59.6	57.2	72.0	52.5
Respiratory disease** _{ab, ac, ad, bd, cd}	23.7	58.1	48.2	68.4	48.5
Sleep disorder** _{ab, ac, ad, bd, cd}	6.7	21.4	15.7	41.8	23.4
Liver disease** _{ab, ad, bc, cd}	14.1	24.5	15.1	15.9	16.0
Cancer** _{ad, bc, cd}	9.0	16.9	11.3	23.4	15.9
Diabetes** _{ab, ac, ad}	6.6	16.1	13.1	19.3	13.5
STD	0.8	2.3	0.9	2.5	1.6
HIV	2.2	4.7	1.7	2.7	2.6
Asymptomatic** _{ab, bc, bd}	0.9	4.1	0.8	1.6	1.5
HIV active	2.1	4.3	1.7	2.6	2.4
HCV** _{ab, ac, ad, bc, bd, cd}	17.8	28.2	16.1	15.8	17.8

The group effect on each outcome variable was tested in the logistic model controlling for age, gender, ethnicity (white vs. non-white), and length of observation. A significant overall group effect is indicated by * for p<0.05 and ** for p<0.01. Significant linear tests (i.e., p<0.05) on equivalence of each pair of coefficients between No Pain (a), OUD first (b), OUD first (c), and Pain first (d) are indicated by the respective groups in each pair.