Psychiatric Comorbidity and Inpatient Characteristics of Older Adolescents with Opioid Use Disorders in the U.S.

Wanqing Zhang*, Kelsey Thompson

Department of Allied Health Sciences, School of Medicine, University of North Carolina at Chapel Hill, United States

***Corresponding Author:** Dr. Wanqing Zhang, Department of Allied Health Sciences, School of Medicine, University of North Carolina at Chapel Hill, 321 S. Columbia Street, Chapel Hill, NC 27599-7122, United States, E-mail: wanqing_zhang@med.unc.edu

Received: 05 January 2021; **Accepted:** 12 January 2021; **Published:** 03 February 2021

Abstract

Objective: The opioid crisis has substantially affected health services utilization. Hospitalizations for opioid use disorders (OUD) have increased significantly among adolescents and youth in the United States. This study examined the characteristics of hospitalization for OUD among older adolescents with comorbid psychiatric disorders (CPD).

Methods: This analysis focused on older adolescents where OUD was given as the primary reason for hospital admission. Multivariable logistic regressions were performed to identify demographic and clinical factors associated with OUD hospitalizations with CPD, using secondary data from the Nationwide Inpatient Sample.

Results: CPD was documented in 58% of OUD adolescent inpatients. Mood and anxiety were the most common types of CPD. Several demographics variables discriminated between OUD inpatients with vs without CPD. The odds of having comorbid mood disorders were nearly 2 times greater for female than for male adolescents and were significantly higher for adolescents from Midwest regions compared with those from Northeast and West regions.

Conclusions: Hospitalizations due to OUD were tripled for adolescents with CPD relative to adolescents without CPD; nearly half of the adolescents hospitalized with OUD had mood disorders. Specific primary care and access to mental health treatment strategies should target groups most at risk for both OUD and mood related disorders.

Keywords: Opioid use disorders (OUD); Comorbid psychiatric disorders (CPD); Older adolescents; Hospitalizations

1. Introduction

Opioid use disorders (OUD) are part of an ongoing public health crisis in the United States. The opioid crisis has substantially affected the healthcare system and health services utilization. For example, opioid hospitalizations among US children and adolescents have doubled in the last decade, with the highest hospitalization rates occurring among older adolescents [1]. Notably, approximately 1 in 1,600 privately insured adolescents have a prescription opioid overdose needing medical attention [2]. This may be due in part to older adolescents' higher risk of opioid exposures; a quarter of high school seniors reported prescription opioid use [3] and the rate of OUD related hospital stays was more than 40 times higher among 19-year-olds than 13-year-olds [4].

Adolescents with substance use disorders (SUD) have a high prevalence of comorbid mental health conditions [5], with a significant number having psychiatric comorbidities [6]. This is not surprising, as adolescence is a critical time for mental health. For example, the onset of approximately half of lifetime mental disorders occurs by age 16 [7]. As such, co-occurring mental and/or SUD is twice higher for older adolescents than for their younger counterparts, perhaps due to the age of onset of mental disorders [4]. The presence of psychological and psychiatric comorbidities may predispose individuals to SUD [8]. For example, the rates of specific types of mental disorders (e.g., mood and disruptive behavior disorders) are much higher among adolescents with SUD [9]. Various socioeconomic factors are also associated with OUD in children and adolescents. Socioeconomic characteristics, such as White non-Hispanic, older adolescence, having insurance, and residing in a region other than Northeastern United States, are associated with the highest rates of opioid prescriptions and opioid use [10].

Inpatient settings play a prominent role in the US healthcare system and provide care for adolescent inpatients with complex health and mental problems. However, despite their critical role in the healthcare system, few studies have been able to examine the patterns of co-occurring mental health problems in inpatient populations of adolescents hospitalized due to a principal diagnosis of OUD. Using national inpatient hospital discharge data, we sought to identify the most frequent comorbid psychiatric disorders (CPD) with which older adolescents were hospitalized for a primary diagnosis of OUD, and investigate the association between the presence of CPD and hospitalization characteristics. Our primary research question was what demographic and clinical factors are associated with different types of CPD among OUD hospitalizations?

2. Methods

2.1 Data source and sample

We conducted a cross-sectional study using data from the Nationwide Inpatient Sample (NIS), which is a part of the Healthcare Cost and Utilization Project (HCUP) sponsored by the Agency for Healthcare Research and Quality (AHRQ). The NIS offers information on diagnoses, procedures, and patient demographics, and it also contains information about hospital characteristics. We used the three years of data from the 2012 and 2014 NIS, with years pooled to improve the precision of estimates and to enable comparisons across subgroups. In this study, we included older adolescents ages 16 to 21 years old. At the time of this study, the most recent 2015 NIS datasets include a

mixture of ICD-9-CM and ICD-10-CM diagnosis codes; thus the 3-year period of 2012-2014 was selected to allow for analysis of a coherent set of variables with the same survey design methods.

2.2 Measures

The International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) was used to identify hospitalizations for OUD. An OUD diagnosis was based on ICD-9 codes: 304.0x, 304.7x, 305.0x, 965.00, 965.01, 965.02, 965.09, 970.1 and related E-codes codes (E850.x E935.x and E940.1). This analysis focused on older adolescents where OUD was given as the primary reason for hospital admission. Therefore, the term "OUD hospitalizations" included adolescents ages between 16 and 21 years with OUD listed in the first diagnosis field of the discharge record. The Clinical Classification Software (CCS) from AHRQ was used to identify the psychiatric comorbidities associated with a first-listed OUD diagnosis (e.g., CCS 657 – Mood; CCS 651 – Anxiety).

The following patient and clinical characteristics were examined: age, sex, race, primary insurance type, median household income of patient ZIP code, discharge status, hospital length of stay (LOS), hospital size, hospital region, hospital teaching status, and the NIS severity adjustment indicator of all-patient refined diagnosis-related group (APRDRG).

2.3 Data analysis

Demographic and clinical characteristics were compared between OUD adolescent inpatients with CPD vs non-CPD. Chi-square tests and t-test were used to compare proportions and means when appropriate. Unadjusted and adjusted logistic regression models were used to estimate the association between OUD hospitalization and the presence of CPD. Furthermore, multivariable logistic regression models were performed to identify the demographic and clinic characteristics associated with OUD hospitalizations with CPD. The two dependent variables for logistic regression analyses were dichotomous: one with principal OUD diagnosis coded as 1 and others coded as 0; another one with both principal OUD diagnosis and secondary CPD coded as 1 and others coded as 0. *Independent variables* included the patient and clinical characteristics stated above. Data analysis was conducted in SAS (version 9.4) survey procedures to calculate national estimates by taking into account the weighted sampling probabilities and standard errors. All differences between estimates noted in the text are statistically significant at the 0.05 level.

3. Results

There were 86,555 hospital discharges associated with an OUD diagnosis in this analysis. In 19.6% (N=16,985) of these discharges, OUD was given as the first listed diagnosis. Of these 16,985 discharges, 57.6% (N=9,775) had CPD. Of these 9,775 discharges, 45.4% were female, 85.7% were white, 57.1% had private insurance coverage, 15.9% were from the lowest quartile of median household income, 32.5% were from the Northeast region, 69.7% were discharged to home, 54.3% were from large hospitals, 53.0% were from teaching hospitals, and 47.9% had moderate severity. The average age was 19.4 years and the mean hospital length of stay was 5.3 days.

Among adolescent inpatients, the top 3 CPD were "mood" (42.0%), "anxiety" (24.4%), and "attention deficit conduct and disruptive behavior disorders (ADHD/DBD)" (10.2%). Both unadjusted and adjusted logistic regression results indicate that the presence of CPD was a significant predictor of OUD hospitalization among older adolescents. After analyses controlled for demographic and clinical characteristics, the odds of OUD hospitalizations were nearly 3 times higher for adolescents with any CPD than for adolescents without CPD (OR=2.8). For the 3 most frequent CPD, the adjusted odds ratios were 2.6 for mood, 2.5 for anxiety, and 1.6 for ADHD/DBD.

	OUD Hospitalization with Mood Disorder			**OUD Hospitalization with Anxiety Disorder**			**OUD Hospitalization with Externalizing**		
Variable	**OR**	**95% CI**	**p**	**OR**	**95% CI**	**p**	**OR**	**95% CI**	**p**
Age	.90	.85– .95	.001	1.06	.99–1.13	ns	.78	.72– .85	<.001
Female (reference: male)	1.88	1.60–2.20	<.001	1.61	1.35–1.92	<.001	.52	.40– .69	<.001
Race (reference: white)									
Black	1.19	.78–1.80	ns	.51	.29– .91	.022	.60	.29–1.23	ns
Hispanic	.88	.63–1.24	ns	.79	.54–1.16	ns	.69	.37–1.29	ns
Public insurance (reference: private)	.91	.76–1.09	ns	1.05	.86–1.28	ns	.80	.60–1.07	ns
Income quartile 0-25th percentile (reference: 76th above)	.99	.76–1.28	ns	.72	.53– .97	.032	.64	.41– 0.997	.048
US census region (reference: Midwest)									
Northeast	.67	.53–.85	.001	.84	.65–1.09	ns	.52	.36–.73	.002
South	.88	.69–1.11	ns	.75	.57– .99	.039	.62	.43–.89	.010
West	.69	.53–.89	.005	1.15	.87–1.52	ns	.42	.28–.64	<.001
Large hospital (reference: small)	.87	.70–1.09	ns	1.06	.83–1.35	ns	1.00	.69–1.45	ns
Teaching hospital (reference: non-teaching)	.89	.75–1.05	ns	.87	.72–1.05	ns	1.35	1.01–1.79	.043
Discharge routine (reference: non-routine)	.78	.66–.93	.007	1.13	.93–1.38	ns	1.06	.80–1.40	ns
Hospital length of stay	1.01	.992–1.04	ns	1.02	.995–1.04	ns	1.01	.996–1.02	ns
Severity of illness (reference: moderate)									
Minor	.26	.22–.31	<.001	.63	.52–.76	<.001	.52	.39–.70	<.001
Major/Extreme	.42	.34–.52	<.001	.60	.47–.76	<.001	.74	.54–1.03	ns

Table 1: Adjusted odds ratios for characteristics associated with OUD hospitalizations by CPD types.

Table 1 summarizes the characteristics associated with CPD among OUD hospitalizations. Multivariable logistic regression analyses revealed that OUD hospitalizations with CPD, as compared to OUD hospitalizations without CPD, were more likely to be among adolescents who were younger, female, from Midwest region and who had moderate severity of illness. For separate analysis of the 3 common CPD, the odds of having mood and anxiety disorders were significantly higher for female adolescents than for male adolescents (OR=1.88; OR=1.61). However, the odds of having ADHD/DBD was significant lower for females (OR=0.52) than for males. The odds of adolescents hospitalized for OUD with mood problems and ADHD/DBD decreased with age (OR=0.90; OR=0.78), while age was not a significant factor for anxiety disorders.

Black adolescents were less likely to have anxiety than white (OR=0.51). In terms of regional differences, the odds of having ADHD/DBD was significantly higher for adolescents from Midwest regions compared with those from other 3 regions; and the odds of having mood disorders was significantly higher for adolescents from Midwest regions compared with those from Northeast and West regions. For anxiety, the only significant regional difference was between South and Midwest.

4. Discussion

In this study, nearly two-thirds of adolescents 16-21 years of age who were hospitalized for a principal OUD diagnosis had CPD, with mood and anxiety as the top comorbidities. After adjusting demographic and clinical characteristics, adolescents with CPD were 3 times more likely to be hospitalized with OUD compared to those without CPD.

Our results reveal that mood disorders were the most commonly associated comorbid condition, followed by anxiety and ADHD/DBD. This is consistent with previous findings from a clinic-based population that adolescents with OUD were more likely to have co-occurring psychiatric disorders such as depression and anxiety-related diagnoses (6). In this inpatient adolescent population, a relatively lower prevalence of externalizing was found. Some studies have suggested that individuals with conduct disorders may be predisposed to opioid use [11] and our data show that about 10% OUD adolescent inpatients had externalizing problems such as ADHD and DBD.

Among specific CPD conditions, OUD adolescents with mood and anxiety disorders were more likely to be female, while OUD adolescent inpatients with externalizing problems were more likely to be male. This is consistent with a previous study that found female opioid users had significantly lower levels of conduct problems and higher levels of internalizing problems during childhood, as compared to male opioid users [12]. Additionally, in the general population sample from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), women were about twice as likely as men to have either a mood or anxiety disorders [13]. In this inpatient population, we found increased risk of emotional rather than behavioral disorders comorbid with OUD in female adolescents.

Adolescents hospitalized with OUD in the Midwest region were more likely to have comorbid mood disorders or externalizing behaviors diagnoses compared to their counterparts in the other three regions. Previous research showed that hospitalization rates for mood disorders in children and adolescence were highest in the Midwest [14]. Research also indicated that higher baseline levels of externalizing were associated with a greater number of substances initiated over time among rural midwestern adolescents [15]. While these are consistent with our findings, geographic variations on co-occurring OUD and CPD need to be further explored in future research to determine factors associated with these differences.

This analysis has several limitations. Our study is limited to community hospitals across the United States. Therefore, this analysis may not be representative of non-community hospitals, such as psychiatric hospitals and rehabilitation or substance abuse treatment facilities. Although we applied the ICD system widely accepted in clinical and health services research, the results of this analysis need to be further validated using Diagnostic and Statistical Manual of Mental Disorders. Another limitation is that due to the deidentified nature of the data, the unit of analysis is the hospital discharge, not a patient. Despite these limitations, the results of this study reflect broader concerns about potentially deteriorating mental health among adolescents with OUD. It is important to augment the best practices for managing adolescents with both OUD and CPD.

5. Conclusions

OUD hospitalizations were significantly more likely in older adolescents with CPD as a whole and in particular with mood, anxiety and external personality disorders. Mood disorders were the most commonly associated comorbid condition; nearly half of the adolescents hospitalized with OUD had mood disorders. Demographic differences such as age, gender, geographic regions are associated with the likelihood of OUD hospitalizations with CPD. Specific primary care and access to mental health treatment strategies that target groups most at risk for OUD and mood related disorders may help alleviate the adverse health outcomes among older adolescents and decrease the burden of health care utilization in inpatient settings.

Acknowledgements

This project is supported by the Health Resources and Services Administration (HRSA) of the U.S. Department of Health and Human Services (HHS). The information, content and/or conclusions are those of the author and should not be construed as the official position or policy of, nor should any endorsements be inferred by HRSA, HHS or the U.S. Government. The authors would like to acknowledge the Healthcare Cost and Utilization Project (HCUP) for supplying the data for this analysis.

Funding Source

This study was supported by the Health Resources and Services Administration (HRSA) of the U.S. Department of Health and Human Services (HHS) under R40MC32880.

Conflict of Interest

The Authors have no conflicts of interest to disclose.

The authors report no financial relationships with commercial interests.

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Citation: Wanqing Zhang, Kelsey Thompson. Psychiatric Comorbidity and Inpatient Characteristics of Older Adolescents with Opioid Use Disorders in the U.S. Journal of Psychiatry and Psychiatric Disorders 5 (2021): 3-10.