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Age differences in emergency department utilization and repeat visits among patients with opioid use disorder at an urban safety-net hospital: A focus on young adults

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Abstract

Background: Opioid use disorder (OUD) among young adults from ages 18 to 25 years is increasing in the United States. Emergency departments (EDs) are recognized as major sources of care for patients with OUD, but questions remain about ED utilization among this population. We examined the demographics and ED utilization patterns at an urban safety-net hospital with a focus on young adults to inform intervention development.

Methods: We extracted demographic and clinical data from electronic medical records of patients ages 18 to 64 years diagnosed with OUD between 2013 and 2017. Descriptive statistics

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Contributors

Ms. Sugy Choi conceptualized the paper, performed the statistical analyses and drafted the paper. Dr. Biello, Dr. Bazzi, and Dr. Drainoni participated in the interpretation of the findings and edited and reviewed the manuscript. All authors contributed to and approved the final draft.

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Conflicts Of Interest
No conflict declared.

were assessed, including race/ethnicity, sex, insurance, other substance use disorder and mental health diagnoses, and ED utilization patterns by age group. Univariable and multivariable logistic regressions were performed to analyze the associations between age and ED utilization patterns.

Results: Among 12,025 OUD patients in the sample, 30% had an ED visit with a primary diagnosis of OUD. Among those who had an ED visit, 48% had at least one additional ED visit within a year. The probability of ED visits (adjusted odds ratio [AOR]:5.04; 95% confidence interval [CI]:4.14-6.13) and repeat ED visits (AOR:3.28; CI:2.53-4.26) were significantly higher among young adults (18-25 years) compared to the oldest age group (56-64 years).

Conclusions: Compared to older adults, young adults with OUD are more likely to use the ED and to have repeat ED visits. The identification of youth-tailored interventions in the ED within broader efforts to address the opioid epidemic should be an urgent priority.

Keywords

Young Adults; Opioid Use Disorder; Opioid-Related Disorder; Emergency Service; Repeated use; Retrospective studies

1. Introduction

The prevalence of opioid use disorder (OUD), which has deleterious health consequences, is increasing rapidly in the United States. Approximately 2.1 million adults ages 12 years or older had OUD in 2016 and opioids contributed to more than 42,249 deaths, representing 66.4% of all drug overdose deaths (Ahrnsbrak et al., 2017; Hedegaard et al., 2017). Subsequently, ED visits for suspected overdose estimates increased 30% from 2016 to 2017 (Agency for Healthcare Research and Quality, 2017; Seth et al., 2018; Vivolo-Kantor et al., 2018).

The likelihood of presenting to the ED among persons who use illicit drugs has been associated with poor access to routine health care services, lack of motivation to use routine services, and adverse health status (Matsuzaki et al., 2018; Pollack et al., 2002). Additionally, individuals who overdose are more likely to have another overdose, (Hall et al., 2008) and are, therefore, to be seen in the ED (Strang et al., 2010). Care in the ED is often episodic and poorly engaged with the next level of care, but because people with OUD are likely to have ED visits, the ED may represent a venue through which OUD patients could be identified and treated in order to prevent repeated overdoses (Coffin et al., 2007; Keane et al., 2018; Shumway et al., 2008; Skinner et al., 2009). And increasingly, the ED has become a recognized venue to initiate pharmacotherapies like buprenorphine for patients with OUD and to engage them in addiction treatment (D'Onofrio et al., 2017, 2015).

Overdose deaths have been increasing among young adults with OUD. Young adults are particularly vulnerable to overdosing since they engage in higher-risk substance use behaviors (Coffin et al., 2007; Hadland et al., 2011; Liebling et al., 2018). Additionally, they are more likely to believe that they are in fact invincible against developing an addiction. However, individuals who use opioids at a younger age are at a higher risk for developing OUD and are more likely to experience severe symptoms and exacerbated health consequences (Sharma et al., 2016). Caring for OUD among young adults can be

challenging since they have lower healthcare utilization than older patients, likely reflecting challenges in engaging younger patients in continuous OUD treatment (Schappert, 2006). Once linked to treatment, younger patients are less likely to remain in care and experience worse treatment outcomes, possibly because fewer providers are trained to manage OUD in young adults (Schuman-Olivier et al., 2014). Such challenges may reflect in part why young adults may utilize ED for their OUD treatment.

Although research on OUD among young adults has recently increased due to the current epidemic of opioid use, their ED utilization remains understudied despite the increasing overdose rates and ED use. We hypothesized that young adults with OUD would utilize the ED and utilize it repeatedly (i.e., have more than one ED episode with a primary OUD diagnosis in a year) than older adults. Thus, we sought to describe the characteristics of OUD patients presenting in the ED of a large urban safety-net hospital by age group. To examine this hypothesis, we focused on an urban safety-net healthcare setting where visits for suspected opioid overdoses have recently increased (Vivolo-Kantor et al., 2018).

2. Methods

2.1. Data and Study Population

We extracted electronic medical record (EMR) data for our study population, patients ages 18 to 64 years with at least one OUD diagnosis across all settings (e.g., ED, inpatient hospitalization, and ambulatory care), at a large, urban safety-net hospital in New England between January 2013 and December 2016. We retrieved EMR records through December 2017 to ensure that everyone in our study sample had at least one year of follow-up period after the index ED visit. The study was approved by the Boston University Medical Campus Institutional Review Board.

2.2. Measures

Our primary outcome, ED utilization, was a binary dependent variable defined as the first ED episode with a primary OUD diagnosis among individuals with an OUD diagnosis from January 2013 to December 2016. We used ICD-9-CM and ICD-10-CM codes to define the OUD diagnoses (ICD-9 codes: 304.0, 304.7, 305.5; ICD-10 codes: F11). Our secondary outcome, repeat ED visits, was a binary dependent variable defined as more than one ED visit with a primary OUD diagnosis over the twelve-month period until December 2017 to ensure that everyone in our study sample had at least one year of follow-up. To capture nonlinear associations that were observed in the exploratory data analyses between age and ED utilization, the primary independent variable was age group (categorized as 18-25, 26-35, 36-45, 46-55, and 56-64 years). The 56-64 age group was the reference group in analyses.

We controlled for characteristics identified in the theoretical and empirical literature as influencing ED and general healthcare utilization (Andersen, 1995; Baker et al., 1996; McCusker et al., 2003; Soril et al., 2016). These sociodemographic covariates included: sex (female, male), race/ethnicity (Non-Hispanic white, Non-Hispanic black, Hispanic of any race, unknown), and payment source or insurance (commercial, Medicaid, Medicare,

uninsured, other/unspecified (Auto Insurance, Charity, Workers Compensation and Government-Assisted Healthcare and other undefined payment sources)). Clinical covariates included other substance use diagnoses (alcohol use disorder, cocaine use disorder) and mental health diagnoses (anxiety disorder, major depressive disorder, bipolar disorder, schizophrenia) according to ICD-9-CM and ICD-10-CM categories (Supplementary Material 1).

2.3. Data Analysis

Age differences in sociodemographic characteristics, insurance, other substance use and mental health diagnoses, and ED outcomes (utilization and repeat visits) were examined using Chi-squared tests. The tests were two-sided and considered statistically significant at $p < 0.05$. Crude logistic regression assessed the relationship between age group and ED outcomes. Multivariable models controlled for factors that were significantly associated with ED utilization in bivariable analyses including the year of visit to control for temporal variation. Analyses were conducted using SAS 9.4 (Cary, NC).

3. Results

3.1. Sociodemographic and Clinical Characteristics by Age

A total of 10,081 unique patients with OUD were identified between January 2013 to December 2016 and included in the study. Table 1 presents sociodemographic characteristics for the following age groups: 18-25 years (11.7%), 26-35 years (32.1%), 36-45 years (21.3%), 46-55 years (22.8%) and 56-64 years (12.1%). Differences in the sociodemographic and clinical characteristics across age groups were significant ($p < 0.001$). In particular, young adults (18-25 years) with OUD diagnoses were more likely to be female (51.2%) and Non-Hispanic white (78.3%), while the oldest adults (56-64 years) were more likely to be male (68.5%) and Non-Hispanic white (42.3%).

Young adults (18-25 years) were more likely to have at least one ED visit with a primary OUD diagnosis than older patients (56-64 years) (44.5% vs. 14.0%; $p < 0.001$). The three youngest age groups (18-25, 26-35, and 36-45) had the highest prevalence of repeat ED visits within a year when using the number of patients in each age group as a denominator (18.4%, 18.0% 17.3%; $p < 0.001$) (see Table 1). However, among ED utilizers whose primary diagnosis was OUD, the oldest age groups (46-55 and 56-64) had the highest prevalence of repeat visits within a year (59.1%, 55.0%; $p < 0.001$) (see Supplementary Material 2).

3.2. Associations Between Age and ED Outcomes

As presented in Table 2, in multivariable models including (sex, race/ethnicity, payment source or insurance, other substance use disorder, and mental health diagnoses), young adults (18-25 years) were more likely to visit the ED with a primary OUD diagnosis (adjusted odds ratio [AOR]: 6.06, 95% confidence interval [CI]: 4.89-7.50) than the reference group of older adults (56-64 years). Women and white patients were less likely to utilize the ED for OUD than men and black patients (AOR=0.57, CI: 0.52-0.63; and AOR=0.86, CI: 0.76-0.97). Medicaid beneficiaries and uninsured patients were more likely to utilize the ED than those with commercial insurance (AOR= 1.54, CI: 1.30-1.83; and

AOR=3.00, CI: 2.08-4.30). Younger adults (18-25 and 26-35 years) were more likely to have repeat ED visits for OUD within a year (AOR=3.70, CI: 2.81-4.88; and AOR=2.91, CI: 2.28-3.71) than the reference group. Sex, race/ethnicity, payment source or insurance, alcohol use disorder, and two mental health disorders (anxiety disorder, schizophrenia) were also significantly associated with repeated ED visits. (Table 2)

4. Discussion

In this study, we examined the association between age and ED utilization and age and repeated ED utilization among patients with OUD with a focus on young adults seen at an urban safety-net hospital in New England. As hypothesized, we found that after adjusting for sociodemographic and clinical factors, young adults were more likely to utilize the ED and return within a year with a primary OUD diagnosis than older adults. In addition, Medicaid beneficiaries were more likely to utilize the ED and be repeat ED utilizers compared to commercially insured patients. The results are in line with previous studies that individuals who utilize the ED are often persons with low-socioeconomic statuses (Hunt et al., 2006; Krieg et al., 2016; Wilson et al., 2000).

Young adults may be more likely to utilize the ED since they are less likely to receive addiction treatment compared to older patients (Hadland et al., 2017a, 2018; Institute of Medicine (US) and National Research Council (US) Committee on the Science of Adolescence, n.d.). Despite the effectiveness of medication for addiction treatment (MAT), only 1 in 4 young adults with OUD receive these medications (Hadland et al., 2017b; Liebling et al., 2016). Without adequate treatment for OUD, patients with OUD are at increased risk of adverse health outcomes, and due to their limited healthcare utilization, they may be more likely to require care in the ED (D'Onofrio et al., 2015). Younger age is negatively associated with success in treatment outcomes for OUD (Dreifuss et al., 2013; Mancino et al., 2010). Suboptimal MAT use was associated with repeated ED utilization among adult patients (Lo-Ciganic et al., 2016).

The findings suggest that younger patients may be relying on the ED for OUD-related health concerns more than older patients. The ED is increasingly viewed as a venue through which patients with substance use disorders can be provided with acute detoxification service referrals for treatment and overdose education (Lynch et al., 2018; Martin et al., 2018; Rubin, 2018). The importance of ED-initiated buprenorphine and facilitated referrals to effective treatment pharmacotherapies such as buprenorphine is becoming widely recognized (D'Onofrio et al., 2015; Martin et al., 2018). One study found that ED-initiated buprenorphine increased engagement in follow-up care compared to brief intervention and reduced hospitalizations and self-reported illicit opioid use (D'Onofrio et al., 2015). As such, EDs are an opportunity for implementing interventions targeting young adults with OUD since this population often seek care in the ED. Age-tailored Screening, Brief Intervention, and Referral to Treatment (SBIRT) programs do not exist for OUD. Future interventions targeting young adults should consider youth-specific facilitators and barriers for treatment which can include relationships with parents, the use of technology and social media, and school support (Dunne et al., 2017).

However, treating young adults with OUD strongly predict challenges given their needs that are distinct from older patients and adolescents. Structural brain changes continue up to age 22 (Silveri, 2012) and young adults are more likely to engage in risky behaviors compared to adolescents (Arnett, 2000). Socially, young adults face vulnerability and resilience from this “emerging adulthood” period (Arnett, 2000). Overall, despite the need for engaging young adults for OUD treatment, there is less emphasis on treatment for young adults compared to prevention interventions (Hadland et al., 2017a). Focusing on young adults with OUD in the ED may provide opportunities to refer such vulnerable group of patients who are at risk of overdose, mortality, HIV/HCV infection, psychosocial impairment, and criminal justice involvement to substance use disorder treatment (Sharma et al., 2016).

Findings from this study should be interpreted in the context of the following limitations. First, EMR data from a single institution offers limited generalizability. Second, our estimates are conservative since we examined only ED visits with a primary diagnosis of OUD; there may be other OUD related ED visits that were not coded as a primary diagnosis. Third, there may be possible differences in provider coding practices over the study period, which coincided with ICD9-to-ICD10 conversion in 2015. Fourth, although we identified associations using cross-sectional data, we cannot establish causal relationships between age and ED outcomes. Finally, although we adjusted for important socio-demographic and clinical covariates, we lacked measures of other potential confounders such as OUD severity. Despite these limitations, to our knowledge, this is the first study to describe the relationship between age and ED presentation with a primary OUD diagnosis among OUD patients at a large, urban safety-net hospital. It is also the first study to suggest that young adult OUD patients have a higher likelihood of returning to the ED within the same year compared to older patients.

5. Conclusion

Age patterns strongly predict ED utilization and repeat ED utilization. In light of the disproportionate burden of OUD among young people, these findings imply that strategies to engage younger OUD patients in the EDs for relapse prevention are needed. This does not mean that we should limit interventions only to young adults, rather, understanding age differences in ED presentation can offer an important opportunity to tailor and improve interventions in the ED. This may be particularly important for young adults who have shown to utilize episodic ED care more than other age groups. However, all ED patients with an OUD should be assessed for medication treatment and referred for follow-up care. Future research should strive to improve age-tailored treatment interventions for young adult patients with OUD in the ED, which may require the education of health professionals in addiction medicine and the development of implementation strategies for such interventions.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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Highlights

- We studied emergency department (ED) use for opioid use disorder (OUD).
- Young adults (18-25 years) were more likely to use the ED and be repeat utilizers.
- The ED may present opportunities for interventions targeting young adults with OUD.

Table 1.

Sociodemographic, clinical & health insurance characteristics by age groups of OUD patients

	Age groups n (%)					Total n=10081	P value
	18 to 25 n=1182	26 to 35 n=3234	36 to 45 n=2144	46 to 55 n=2299	56 to 64 n=1222		
Gender							
Female	605 (51.2)	1448 (44.8)	726 (33.9)	758 (33.0)	385 (31.5)	3922 (38.9)	<0.001
Male	577 (48.8)	1786 (55.2)	1418 (66.1)	1541 (67.0)	837 (68.5)	6159 (61.1)	
Race and Ethnicity							
Non-Hispanic White	925 (78.3)	2413 (74.6)	1209 (56.4)	1031 (44.9)	517 (42.3)	6095 (60.5)	<0.001
Non-Hispanic Black	100 (8.5)	311 (9.6)	384 (17.9)	786 (34.2)	528 (43.2)	2109 (20.9)	
Hispanic	118 (10.0)	406 (12.6)	466 (21.7)	403 (17.5)	141 (11.5)	1534 (15.2)	
Other/Unspecified	39 (3.3)	104 (3.2)	85 (4.0)	79 (3.4)	36 (3.0)	343 (3.4)	
Payment source (Insurance type)							
Commercial	228 (19.3)	186 (5.8)	138 (6.4)	181 (7.9)	107 (8.8)	840 (8.3)	<0.001
Medicaid	805 (68.1)	2558 (79.1)	1571 (73.3)	1430 (62.2)	610 (49.9)	6974 (69.2)	
Medicare	34 (2.9)	239 (7.4)	290 (13.5)	568 (24.7)	457 (37.4)	1588 (15.8)	
Self-pay/Uninsured	35 (3.0)	62 (1.9)	37 (1.7)	15 (0.7)	5 (0.4)	154 (1.5)	
Other/Unspecified	80 (6.8)	189 (5.8)	108 (5.0)	105 (4.6)	43 (3.5)	525 (5.2)	
Other substance use disorder diagnoses							
Alcohol use disorder	106 (9.0)	400 (12.4)	370 (17.3)	439 (19.1)	197 (16.1)	1512 (15.0)	<0.001
Cocaine use disorder	142 (12.0)	416 (12.9)	294 (13.7)	270 (11.7)	107 (8.8)	1229 (12.2)	<0.001
Mental health diagnoses							
Anxiety	415 (35.1)	1420 (43.9)	937 (43.7)	1005 (43.7)	510 (41.7)	4287 (42.5)	<0.001
Major depressive disorder	176 (14.9)	635 (19.6)	547 (25.5)	708 (30.8)	324 (26.5)	2390 (23.7)	<0.001
Bipolar	57 (4.8)	164 (5.1)	141 (6.6)	178 (7.7)	67 (5.5)	607 (6.0)	<0.001
Schizophrenia	32 (2.7)	145 (4.5)	143 (6.7)	168 (7.3)	63 (5.2)	551 (5.5)	<0.001
Emergency department utilization with a primary OUD diagnosis	526 (44.5)	1233 (38.1)	689 (32.1)	535 (23.3)	171 (14.0)	3154 (31.3)	<0.001
Repeat emergency department utilization (have more than one ED episode) with a primary OUD diagnosis in a year	217 (18.4)	581 (18.0)	370 (17.3)	316 (13.4)	94 (7.7)	1578 (15.7)	<0.001

Table 2.

Associations between sociodemographic and clinical characteristics and emergency department utilization outcomes

	Emergency department utilization with a primary OUD diagnosis			Repeat emergency department utilization (have more than one ED episode) with a primary OUD diagnosis in a year		
	Adjusted* Odds Ratio	95% Confidence Interval	P value	Adjusted* Odds Ratio	95% Confidence Interval	P value
Age groups						
18 to 25	6.06	(4.89, 7.50)	<0.001	3.70	(2.81, 4.88)	<0.001
26 to 35	4.20	(3.47, 5.07)	<0.001	2.91	(2.28, 3.71)	<0.001
36 to 45	2.90	(2.39, 3.52)	<0.001	2.40	(1.87, 3.08)	<0.001
46 to 55	1.84	(1.52, 2.23)	<0.001	1.79	(1.40, 2.29)	<0.001
56 to 64	Ref			Ref		
Gender						
Female	0.57	(0.52, 0.63)	<0.001	0.62	(0.55, 0.70)	<0.001
Male	Ref			Ref		
Race and Ethnicity						
Non-Hispanic White	0.86	(0.76, 0.97)	0.002	0.87	(0.74, 1.01)	0.067
Hispanic	1.06	(0.91, 1.23)	0.478	1.18	(0.98, 1.42)	0.075
Other/Unknown	0.64	(0.49, 0.85)	0.017	0.40	(0.26, 0.63)	<0.001
Non-Hispanic Black	Ref			Ref		
Payment source (Insurance type)						
Medicare	1.26	(1.02, 1.55)	0.032	1.71	(1.27, 2.31)	<0.001
Medicaid	1.54	(1.30, 1.83)	<0.001	2.24	(1.73, 2.91)	<0.001
Self-pay/Uninsured	3.00	(2.08, 4.30)	<0.001	2.22	(1.34, 3.68)	0.002
Other	1.11	(0.86, 1.43)	0.418	1.71	(1.20, 2.45)	0.003
Commercial	Ref			Ref		
Other Substance use disorder						
Alcohol use disorder	0.85	(0.75, 0.96)	0.009	0.71	(0.61, 0.82)	<0.001
Cocaine use disorder	1.06	(0.92, 1.21)	0.423	0.91	(0.77, 1.07)	0.248
Mental health condition						
Anxiety	1.02	(0.94, 1.12)	0.950	0.56	(0.50, 0.63)	<0.001
Major depressive disorder	1.35	(1.21, 1.50)	<0.001	1.11	(0.97, 1.27)	0.137
Bipolar	1.07	(0.88, 1.29)	0.804	0.94	(0.75, 1.18)	0.605
Schizophrenia	0.56	(0.47, 0.66)	<0.001	0.38	(0.31, 0.46)	<0.001

* adjusted for all other model terms and year of index visit