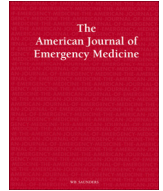




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Impact of COVID-19 pandemic on emergency department substance use screens and overdose presentations

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ABSTRACT

Background: The COVID-19 pandemic can exacerbate underlying substance use disorder and has impacted this vulnerable population in a variety of ways. There are limited data regarding how this pandemic has impacted emergency department (ED) patient presentations.

Methods: We extracted data on ED visits from the electronic health record (EHR) of a large healthcare system in the Washington, DC/Baltimore, MD metropolitan area. The dataset includes data from 7 hospitals on ED visits between 11/1/2019–6/30/2020. The health system utilizes a validated screening program for substance use, Screening, Brief Intervention, and Referral to Treatment (SBIRT), for ED patients who are clinically stable and willing to complete screening. We evaluated trends in patients with a positive SBIRT screen and those presenting with a clinical diagnosis of acute alcohol or substance intoxication/overdose before (11/1/19–2/29/2020-pre) and during the first wave of the COVID pandemic (3/1/2020–6/30/2020-post). Data were described using descriptive statistics. Bivariate analyses were conducted using chi-square test and two-sample *t*-tests. Interrupted time series analysis was used to evaluate the changes in the weekly trends with the start of the pandemic.

Results: There were 107,930 screens performed in the EDs during the study period (61,961 pre, 45,969 post). The population was primarily African American (64.7%) and female (57.1%). Positive SBIRT screens increased from 12.5% to 15.8% during COVID ($p < 0.001$). Alcohol intoxication presentations increased as a proportion of positive screens from 12.6% to 14.4% ($p = 0.001$). A higher percentage of screened patients reported problem drinking (AUDIT score ≥ 7) during the pandemic (2.4% pre vs 3.2% post, $p < 0.001$). Substance intoxication/overdoses among all screened increased from 2.1% to 3.1% ($p < 0.001$) and as a percentage of positive screens during the pandemic (16.8% to 20%, $p < 0.001$). The proportion of opioid vs. non-opioid overdoses remained unchanged before (67%) and during the pandemic (64%, $p = 0.33$).

Discussion: There was an increase in the proportion of positive SBIRT screens and visits for acute overdoses and intoxication during the first wave of the COVID-19 pandemic. Additional research should focus on mitigation strategies to address substance use during this vulnerable time.

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1. Introduction

The United States is in the midst of the COVID-19 pandemic superimposed over a pre-existing opioid and substance use crisis. With an estimated 20 million people in the US with substance use disorder, this drug epidemic leads to more than 90,000 drug overdose deaths every year [1,2]. Nationally, the number of emergency department (ED) visits for opioid overdoses has been increasing [3]. The ED is often the front line for treatment of acute substance use presentations and

detection of at-risk alcohol or drug use. Various studies have shown ED volumes decrease by as much as 63% during the COVID-19 pandemic [4]. Additionally, increased rates of ED presentations for self-harm, mental health conditions, intimate partner violence, child abuse, and opioid overdoses have been reported during the pandemic, highlighting the need to address this larger public health crisis [5]. Web-based survey data have shown an increase in alcohol, tobacco, and cannabis use rates worldwide during the COVID-19 pandemic [6].

The impact of COVID-19 was unprecedented and devastating to the support and infrastructure for patients with substance use disorder. One study showed a drop-off rate of 53% in the initiation of buprenorphine in the ED during the months after the start of the pandemic, in part due to

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the removal of social workers and substance use navigators from the EDs [7]. Facility closures and resource shortages exacerbated pre-existing barriers to care. These barriers and other social determinants of health also contributed to the racial disparities seen among patients with COVID-19 related deaths and drug overdoses [8,9]. There was a disproportionate increase in opioid overdoses among non-Hispanic Black individuals compared to a decrease in non-Hispanic White individuals during the pandemic [9]. Although several studies have reported trends in increasing opioid overdoses and lower ED volumes during the COVID-19 pandemic, there is limited information pertaining to ED presentations of intoxication, alcohol use, and other drug use, as well as identifying vulnerable populations at risk of substance use exacerbation during the pandemic. As the pandemic and its aftermath continue to affect many aspects of life, the changing healthcare and social needs of individuals with substance use disorder must be addressed.

Screening, Brief Intervention, Referral for Treatment (SBIRT) is a comprehensive public health approach to deliver intervention and treatment for individuals who are at risk for or who currently use alcohol or other substances. The SBIRT program was first initiated in this hospital system in Baltimore in 2015 [10]. The success of the program led health system leaders to expand the program to its other Baltimore and surrounding hospitals and as of 2021, it has been implemented in all ten hospitals covering the Washington, DC, and Baltimore areas. The model employed the evidence-based SBIRT intervention to provide universal screening of all ED patients using validated screening instruments, including AUDIT, with brief interventions and warm handoffs to treatment delivered through a team of peer recovery coaches stationed in the ED. An AUDIT score is a numerical value that represents alcohol use behaviors, with a score ≥ 7 indicative of problem drinking. This study evaluates trends of patients presenting for substance use and those with positive substance use screens in EDs in a single healthcare system in the Baltimore/DC area before and after the first wave of the COVID-19 pandemic.

2. Methods

A retrospective chart review was conducted using the SBIRT data extracted from an electronic health record (EHR), MedConnect, from seven EDs in a 10-hospital healthcare system located in the Baltimore and DC areas. These hospitals serviced the population of the DC and Baltimore/Maryland metropolitan areas. The population of DC via the 2019 census was 46% White and 46% Black; 11.3% were Hispanic. For Baltimore, it was 30.5% White, 62.4% Black; 5.3% were Hispanic [11]. We studied data for seven out of the 10 hospitals in the system, as those hospitals had data for both before and after the start of the pandemic. The distribution of hospital locations and the racial demographics for unique emergency department patients at each location were observed. For hospitals in the DC area, of the 37,777 unique patients recorded during the study time period, 67.7% (25,562) were African American, 18.6% (7037) were White, and 13.7% (5178) were categorized as “Other”. For hospitals in the Baltimore area, of the 45,526 unique patients observed, 60.3% (27,449) were African American, 34.0% (15,475) were White, and 5.7% (2602) were categorized as “Other”.

The population included in this study consisted of all ED patients who received SBIRT screening and/or those who presented to the ED with a clinical diagnosis of overdose or intoxication between November 1, 2019, and June 30, 2020. The SBIRT screen was performed on all patients who entered the ED and were alert, oriented, and clinically stable. Patients who were screened in non-ED locations, those who were under 17 years old, patients who presented with severe mental illness, were critically ill or non-verbal, and those who were under police custody were excluded from screening per SBIRT protocol. The initial screening asked a series of questions about frequency, quantity, and type of substance use. If patients were acutely intoxicated, a screen was performed when they were sober. All patients who were intoxicated, had a suspected unintentional or intentional opioid or nonopioid overdose,

had used drugs in the past 12 months, or had an AUDIT score ≥ 7 were considered a positive SBIRT screen. Patients with a positive SBIRT screen undergo a brief intervention, and if the patient was agreeable, a referral to treatment. Patients who present with acute intoxication or unintentional or intentional overdose were all evaluated by a peer recovery coach.

SBIRT data were examined weekly over the time frame of November 1, 2019, through June 30, 2020, including information from seven EDs. March 1, 2020, was used as the date to delineate pre-COVID from post-COVID. Early March was when both DC and Baltimore reported their first COVID-19 cases and both areas declared a state of emergency due to the pandemic [12]. Our primary goal was to evaluate SBIRT positive screens and intoxications/overdose for alcohol or other drugs before and after the pandemic started. Secondary outcomes included AUDIT score and drugs used in the past 12 months. This study was reviewed and approved by the Institutional Review Board.

Patient-level data were summarized using means and standard deviations for continuous variables and frequencies and percentages for categorical variables. The differences between the periods (1–18 weeks vs 19–36 weeks) in categorical outcomes were tested with a chi-square test. The number of patients and percentage of patients aggregated weekly were examined using visual methods and interrupted time series analyses that included a dummy variable representing the start of the pandemic period. Spline regression analyses were also conducted to examine the trends in the pre and post periods for male and female patients and for three different racial groups (African American, White, and Other).

3. Results

3.1. Positive screens pre vs post start of COVID-19 pandemic

There were 107,930 total SBIRT screens conducted between November 1, 2019, and June 30, 2020. Of those screens, 61,961 were obtained between November 1, 2019, and February 29, 2020, and 45,969 between March 1, 2020, and June 30, 2020, showing a 25% decrease in the total number of patients screened during the latter time period. Approximately 2.6% of those who presented to the ED refused to be screened (2867/112,617). Unique patient characteristics are presented in Table 1. The majority of the population was African American (64.7%) and female (57.1%). Seventy percent of the population were between 25 and 64 years old, 12.5% were under 25 and 17.5% were 65 years or older. Hispanics constituted 3.2% of the screened ED

Table 1
Demographics

Patient Characteristics (Unique Patients)	All N = 84,367 N (%)	Pre-Covid-19 Period (Weeks 1–18) N = 49,245 N (%)	During Covid-19 Period (Weeks 19–36) N = 35,122 N (%)	p-value
Gender				
Male	35,986 (42.6)	20,090 (40.8)	15,878 (45.2)	<0.001
Female	48,399 (57.4)	29,155 (59.2)	19,244 (54.8)	
Race				
African-American	53,011 (63.6)	31,075 (63.9)	21,936 (63.3)	<0.001
White	22,512 (27.0)	13,276 (27.3)	9236 (26.6)	
Other	7780 (9.3)	4287 (8.8)	3493 (10.1)	
Age				
<25	9874 (11.7)	5787 (11.8)	4087 (11.7)	<0.001
25–44	32,986 (39.2)	18,955 (38.6)	14,031 (40.0)	
45–64	25,689 (30.5)	14,825 (30.2)	10,864 (31.0)	
≥ 65	15,687 (18.6)	9592 (19.5)	6095 (17.4)	
Ethnicity				
Non-Hispanic	76,960 (92.9)	45,178 (93.6)	31,782 (91.9)	<0.001
Hispanic	2903 (3.5)	1535 (3.2)	1368 (4.0)	
Unknown	3013 (3.6)	1564 (3.2)	1449 (4.1)	

patients. There was an increase in the percentage of male patients during the COVID-19 period from 41.1% to 45.3% ($p < 0.001$).

SBIRT screening outcomes changed during the post-period in comparison with the pre-period (Table 2). The rate of positive screens increased by approximately 30%, from 12.3% pre to 15.8% post ($p < 0.001$). Similarly, the rate of acute substance use presentations, such as for alcohol intoxication, rose by 44%, from 963 (1.6%) pre to 1046 (2.3%) post ($p < 0.001$) and suspected substance overdose rose by 75% from 491 (0.8%) pre to 635 (1.4%) post ($p < 0.001$). Markers for chronic substance use, measured by “yes” to drugs used in the past 12 months and AUDIT score ≥ 7 , also increased by 25% from 9.2% to 11.5% ($p < 0.001$) and 33% from 2.4% to 3.2% ($p < 0.001$) respectively. The rates for opioid overdose compared to non-opioid overdose remained the same (67% pre vs 64% post-COVID, $p = 0.33$).

3.2. Spline regression of SBIRT positive screens

Spline regression models with a spline at week 19 were used to compare the trends before and after the start of the COVID-19 pandemic. Fig. 1 presents weekly predictive margins for the percentage of patients who screened positive for SBIRT throughout the time period of November 1, 2019, through June 30th, 2020, with a time interruption in the first week of March 2020 (week 19). The 36th week only included 5 days. There was a change in the slope of the regression line at week 19 ($p = 0.0002$) for the percentage of positive screens indicating a steeper trend in the post-period (Fig. 1).

3.3. Spline regression of SBIRT positive screens by sex/race

Fig. 2 illustrates the differences in the trends for the percentage of male and female patients who screened positive before and after the pandemic started. In the post-period, there is a significant upward trend for both female (slope = 0.40, SE = 0.08, $p < 0.001$) and male (slope = 0.30, SE = 0.07, $p < 0.001$) patients.

Fig. 3 illustrates the differences in the trends for the percentage of African American patients, White patients, and those categorized in “Other” group who screened positive before and after the pandemic started. When the pre and post slopes are compared within each race group, all race groups show a steeper increase in the post-period. When evaluating the weekly predictive margins for the percentage of overdose/intoxication presentations over the same time period, the post-period showed a significant upward trend for African American patients only (slope = 0.11, SE = 0.02, $p < 0.0010$).

3.4. Repeat ED visits

To evaluate the extent of repeat ED visits, we examined the data set for unique patient ID numbers. There were 84,367 unique patients in the data set, which comprises 78% of the recorded visits. 22% were repeat visits. The number of unique patients was 35,119 (76.4% of all

Table 2
SBIRT screening outcomes.

SBIRT Screening Outcomes N = 107,930	Pre-Covid-19 Period (Weeks 1–18) N = 61,961 N (%)	During Covid-19 Period (Weeks 19–36) N = 45,969 N (%)	p-value
Positive screen	7642 (12.3)	7247 (15.8)	<0.001
Drug use in the past 12 months	5623 (9.2)	5174 (11.5)	<0.001
Drug Overdose	491 (0.8)	635 (1.4)	<0.001
Opioid overdose (vs non-opioid)	327 (67)	407 (64)	0.33
Audit ≥ 7	1476 (2.4)	1423 (3.2)	<0.001
Alcohol intoxication	963 (1.6)	1046 (2.3)	<0.001
Overdose or Intoxication	1283 (2.1)	1445 (3.1)	<0.001

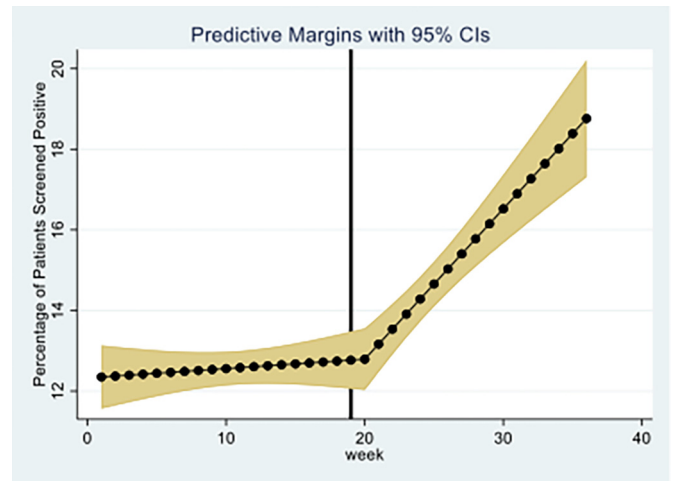


Fig. 1. Spline Regression Analysis of Weekly Percent SBIRT Screens: shows a spline regression analysis of the weekly percent positive screens of all emergency department visits between 11/1/2019–6/30/2020 with a time interruption at week 19. The pre-slope coefficient was 0.02 (standard error (SE) = 0.03) and the post-slope coefficient was 0.37 (SE = 0.06) showing that positive screens were relatively stable with a weekly non-significant increase by 0.02 percentage points ($p = 0.50$) in the pre-period but showed a significantly larger weekly increase by 0.37 percentage points in the post-period ($p < 0.001$).

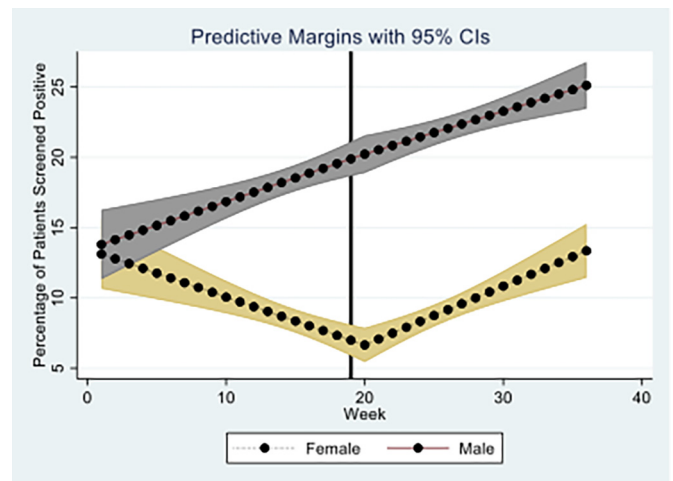


Fig. 2. Spline Regression Analysis of Weekly Percent SBIRT Screens by Sex: shows a significant increase in weekly positive screens for females in the post-period (3/1/20–6/30/20) in comparison with the pre-period (11/1/19–2/29/20); ($p < 0.001$).

encounters) in the post period and 49,248 (79.5% of all encounters) in the pre period.

4. Discussion

The impact of the COVID-19 pandemic on ED patient presentations for substance use and positive screens was significant. Nationally, ED volumes decreased dramatically during the COVID-19 pandemic [13]. The steep decline in the absolute number of ED SBIRT screens observed after March 1, 2020, could be attributed to many reasons, including patients’ fear of contracting the virus itself from a visit to the ED, compliance with stay at home orders, increased telehealth, and closing of bars [4,14]. The increase in substance use rates observed after March 1, 2020, is likely multifactorial, including barriers to care and increased emotional and financial stressors attributed to the pandemic. For example, many patients participating in opioid treatment programs

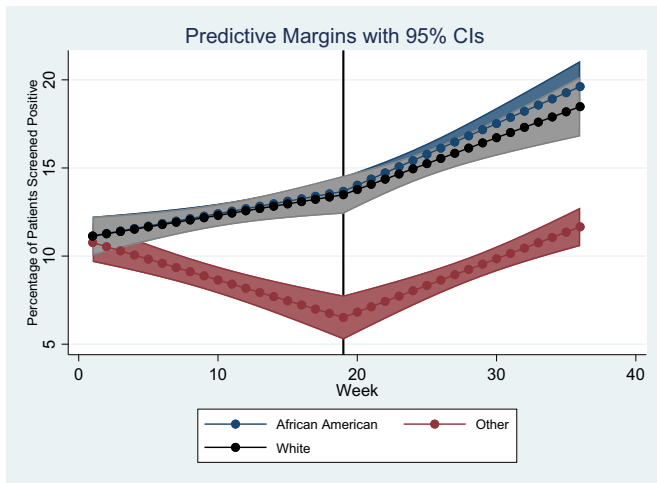


Fig. 3. Spline Regression Analysis of Weekly Percent SBIRT Screens by Race: presents weekly predictive margins for the percentage of SBIRT positive screens for three race groups across 36 weeks with a spline at week = 19. All race groups show a steeper increase in the post-period compared to the pre-period.

necessitate daily in-person methadone administration. The implementation of social distancing guidelines led to facility closures and resource shortages. This also made it difficult for patients to see physicians for buprenorphine prescriptions. Patients may not have been able to get care because of a need to quarantine and office closures. Additionally, the pandemic minimized the in-person support systems and recovery coaching available to patients during a time of significant stress and social isolation. These factors likely explain why there was a large increase in the number of acute substance use presentations (overdose and intoxication) observed in the ED. The economic burden of loss of jobs and health insurance may have also played a role in the treatment options available for people with substance use disorder, contributing to the increase in both acute and non-acute substance use presentations. Additionally, previous studies have shown that individuals with substance use disorder are at higher risk for contracting COVID-19 and for having adverse outcomes if infected [15], highlighting the importance of accessible healthcare.

The trends in substance use after the start of the COVID-19 pandemic between different races were also pronounced in this study. Specifically, African American patients presented with disproportionately increased rates of overdose/intoxication when compared to Whites and Other races. The pandemic led to an exacerbation of pre-existing stressors and barriers to care that may have contributed to the increased substance use rates. This disparity was also seen in COVID-19 infection and hospitalization rates [9]. Rates for African Americans were 21.8% [16] and 33% [17] respectively, while comprising only 13% of the US population. These staggering numbers emphasize the underlying social determinants of health widely observed throughout the US and their impact on health and disease morbidity.

This unprecedented time also led to many changes in the guidelines on addiction medicine [18]. The Substance Abuse and Mental Health Service Administration (SAMHSA) modified their guidelines to allow the writing of longer take-home prescriptions [16,17] and the initiation of treatment through telehealth visits for patients with opioid use disorder, and waived required in-person physical exams [19,20] and routine urine drug testing. Medicare expanded coverage for telehealth services and there was a push for an increase in buprenorphine and naloxone prescriptions [21]. Although these positive changes were implemented to minimize barriers for patients to access treatment, they took time to implement and, therefore, likely did not play a large role in preventing this observed increase in substance use rates.

It should be noted that there are several limitations to this study. These data belong to a specific healthcare organization with high minority and low-income populations and therefore may not be generalizable to the US population. As all ED patients at the seven hospitals included in this study received SBIRT screening with minimal exclusions, this data is representative of that overall ED population. However, when comparing the study demographics to the DC and Baltimore 2019 census, our study showed higher rates of ED visitations from minority populations [11]. However, arguably this is the most important population to focus efforts on mitigation strategies to address substance use during this vulnerable time. The barriers to care in low-income populations are only further exacerbated by lack of technology and funds. It should be noted that there are variations in resources depending on the geographic area (urban vs. suburban), which could influence the robustness of the SBIRT program and availability of methadone clinic and peer recovery coaches, further limiting generalizability. While the regional differences between hospitals are an important area for further study, we did not include data from the individual sites in this study as they were in different statuses in regards to the robustness of their SBIRT processes, which could be a potential confounder. However, this is an area we intend to actively study in the future.

Another limitation of this study is that the two groups are in different seasons and there may be seasonal, secular, or annual trends. However, due to the evolving nature of the drug epidemic and the expansion of the SBIRT program in the studied hospital system, previous year data would not provide the same baseline demographics. Also, the low ED volume in the post-period limited the ability to analyze trends in absolute percent change in comparison to relative percent change.

The extent of repeat ED visits in our patient population is a limitation to the study, as substance use can commonly present with repeat ED visits. However, this study is unique in that a “positive screen for substance use” was defined not only by acute overdose and intoxication presentations, but also by the AUDIT score and history questions on drug use. Additionally, the comparison of population demographics for all ED visits and unique patients was negligible.

The COVID-19 pandemic co-occurring with the substance use crisis has led to a dramatic increase in use rates of alcohol and other drugs during the four months pre and post 3/1/2020 in the Baltimore and DC area. This increase in substance use associated with the COVID-19 pandemic will have long-term implications for patients and healthcare systems, as addiction is a chronic illness. There is a need to expand the already limited availability of resources for substance use disorder prevention, early intervention, and treatment as the system experiences a greater number of patients post-pandemic. There should be a specific focus on the needs of vulnerable populations and their access to resources during this time.

5. Conclusion

There was a significant increase in positive ED substance use screens and visits for acute overdose and intoxication during the first wave of COVID-19. There is an urgent need to address these co-occurring public health crises and minimize barriers to treatment for patients with substance use disorders.

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Declaration of Competing Interest

The authors whose names are listed immediately below certify that they have NO affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

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