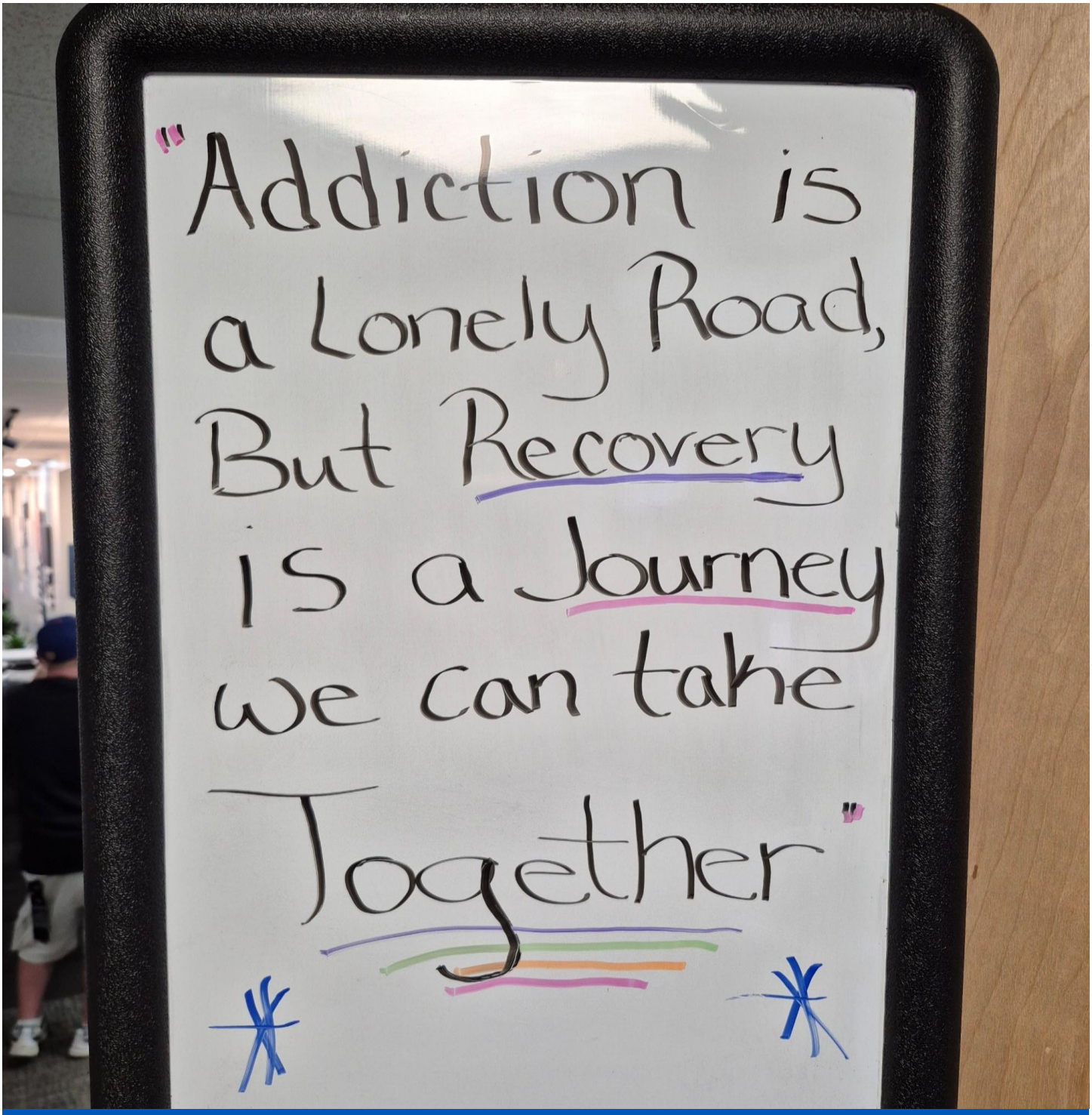

Investigation of an ongoing outbreak involving emerging drugs — Cecil County and Baltimore City, Maryland, 2025

Final Report

Epi-Aid 2025-009: Investigation of an ongoing outbreak involving emerging drugs — Cecil County and Baltimore City, Maryland, 2025

Final Report

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Abbreviations

APHL	Association of Public Health Laboratories
ASAM	American Society for Addiction Medicine
BCHD	Baltimore City Health Department
CATCH	Cecil Addiction Treatment Coordination Hotline
CCHD	Cecil County Health Department
CDC	Centers for Disease Control and Prevention
CFSRE	Center for Forensic Science Research and Education
CPR	Cardiopulmonary resuscitation
COWS	Clinical Opiate Withdrawal Scale
DOSE	Drug Overdose Surveillance and Epidemiology
DOP	Division of Overdose Prevention
ED	Emergency Department
EHR	Electronic Health Record
EIS	Epidemic Intelligence Service
EMS	Emergency Medical Services
EMT	Emergency Medical Technician
ESSENCE	Electronic Surveillance System for the Early Notification of Community-Based Epidemics
HIDTA	High Intensity Drug Trafficking Area
ICD-10-CM	International Classification of Diseases, Tenth Revision, Clinical Modification
ICU	Intensive Care Unit
IMF	Illegally-made fentanyl
IOP	Intensive Outpatient Program
MACS	Maryland Addiction Consultation Services
MDH	Maryland Department of Health
MMWR	Morbidity and mortality weekly report
MOUD	Medications for Opioid Use Disorder
NCIPC	National Center for Injury Prevention and Control
NIST	National Institute of Standards and Technology
NPS	Novel Psychoactive Substances
NSSP	National Syndromic Surveillance Program
OADPOP	Opioid Associated Disease Prevention and Outreach Program
OD2A	Overdose Data to Action
ODMAP	Overdose Detection Mapping Application Program
OOPE	Office of Overdose Prevention and Education
OOR	Office of Overdose Response
ORP	Overdose Response Program
ORS	Overdose Response Strategy
OTP	Opioid Treatment Program
PORT	Prevention Overdose Response Team
PPW	Pregnant and parenting women
PRS	Peer Recovery Specialist
PARO	People at risk of overdose
RAD	Rapid Analysis of Drugs
S-PED	Sustaining Peers in the Emergency Department
SUD	Substance use disorder

Executive Summary

In June of 2025, the Maryland Department of Health (MDH) requested assistance from the Centers for Disease Control and Prevention (CDC) to investigate an increase in withdrawal symptoms among people at risk of overdose (PARO) seeking care in treatment facilities and hospitals in Cecil County, Maryland. This increase was suspected to be associated with medetomidine, an α2-adrenergic agonist that is not approved for human use, as it coincided with medetomidine detection in community-based drug checking samples.[1,2] In addition, on July 10, 2025, twenty-seven non-fatal overdoses occurred in the Penn-North neighborhood of west Baltimore City. Medetomidine was initially suspected to be involved in these overdoses; however, testing of two syringes collected during neighborhood canvassing on July 10, 2025 detected fentanyl and an illegal benzodiazepine, N-Methylclonazepam.[3]

Further investigation was needed to better understand increases in withdrawal symptoms and unusual spikes in overdoses where sedative adulterants were detected, with a primary focus on medetomidine. In response to the state's request, an epidemiological assistance (Epi-Aid) team was assembled from the CDC's National Center for Injury Prevention and Control (NCIPC), the National Center for HIV, Viral Hepatitis, STD and TB Prevention, and Public Health Infrastructure Center. The team consisted of four Epidemic Intelligence Service (EIS) officers, Drs. Nhia Vang, Emilia Pawlowski, Kate Campbell, and Katie McNabb, with support from the NCPIC's Division of Overdose Prevention (DOP) scientists.

The objectives of the Epi-Aid were to:

1. Increase capacity to use syndromic surveillance system to monitor changes in withdrawal symptoms, including through case definition and query development, to support building MDH's infrastructure to identify changes in the drug supply.
2. Provide a gap assessment to evaluate and provide recommendations on laboratory testing of non-fatal overdoses.
3. Conduct interviews with PARO and use findings to develop community and first responder guidance for cases involving medetomidine and sedative adulterants.
4. Conduct interviews with clinical response partners in a variety of settings, including hospitals, primary care and specialty behavioral health, and utilize findings to develop guidance for clinical partners.
5. Conduct interviews with response partners from a variety of settings to gain insights into the Baltimore City overdose spike event response on July 10, 2025.
6. Investigate the prevalence, incidence and characteristics of severe symptoms resulting from polysubstance opioid use including sedative adulterants through interviews, medical chart abstraction and other data analysis as available to inform the development of guidance document.

Beginning on July 27th, 2025 over a 20-day period, Drs. Vang, Pawlowski, Campbell, and McNabb traveled to Cecil County and Baltimore City to meet with key partners involved in overdose prevention and response in Maryland. Drs. Campbell and Pawlowski developed a case definition for medetomidine withdrawal and completed chart abstraction and analysis to characterize medetomidine withdrawal. They also tested a new syndrome definition using syndromic surveillance data. Drs. McNabb and Vang conducted interviews with providers from a variety of healthcare settings and with PARO to learn about experiences identifying and managing medetomidine-related withdrawal. Dr. Vang conducted an environmental scan of Maryland's current systems for overdose biosurveillance, reviewing documents and interviewing key partners and providers to identify gaps and existing resources.

KEY FINDINGS

Objective 1: Syndromic surveillance to monitor withdrawal changes

- Testing of the preliminary medetomidine withdrawal syndrome definition shows promise for detecting shifts in withdrawal patterns in Maryland that may signal drug supply changes.
- Significant differences in withdrawal-related emergency department (ED) visit rates were observed by sex, race/ethnicity, age and geography, with the highest ED-visit rates along the Interstate-95 corridor.
- The syndrome's specificity is limited by the absence of medetomidine-specific discharge diagnosis codes in the International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM), lack of confirmatory toxicology testing, and incomplete capture of key distinguishing features (symptom severity and vital sign abnormalities).

Objective 2: Gap assessment for overdose biosurveillance

- Overdose biosurveillance refers to the analysis of biological specimens (e.g., blood, urine) from non-fatal overdose ED visits to detect and characterize substances for public health surveillance.
- An environmental scan of Maryland's overdose surveillance infrastructure, including biosurveillance capacity and gaps in identifying substances in the drug supply, was conducted through document reviews and interviews with seven key informants.
- Maryland has strong overdose surveillance systems; however routine confirmatory toxicology testing for substances involved in non-fatal overdoses is not currently conducted.
- Existing systems provide near-real time data on overdose incidence and geography (e.g., ED, EMS, poison control) while other sources (e.g., mortality data, law enforcement seizure, forensic toxicology and drug checking) confirm substances but are largely limited to post-mortem testing, legal investigations or paraphernalia testing.
- Key informants expressed broad support for biosurveillance's population-level value in identifying substances contributing to non-fatal overdoses, detecting new or emerging substances causing severe or atypical illness and informing prevention and response planning.
- MDH would need to address the following gaps to implement biosurveillance: clarify legal authority, engage partners, define specimen acquisition processes, identify laboratories capable of definitive toxicology testing and establish mechanisms for data integration and reporting.

Objective 3 and 4: Medetomidine-related findings – Cecil County

- A total of 29 interviews were conducted with 39 providers, along with eight interviews with PARO.
- Findings reflect a volatile and evolving drug supply, characterized by declining overdose deaths but increases in non-fatal overdoses and severe withdrawal.
- Cecil County has hospital and community-based overdose prevention and substance use services, with access facilitated by financial assistance, low-barrier programs, and peer recovery specialists (PRS).
- Persistent barriers to substance use-related treatment and prevention include limited awareness of resources, constrained treatment capacity, funding instability, discrimination, negative attitudes and believes about PARO, life stressors, and structural challenges such as transportation, housing insecurity, and childcare.
- Across settings, interviewees were knowledgeable about or directly impacted by medetomidine; in the absence of toxicology testing, medetomidine exposure was inferred based on clinical presentation, withdrawal severity, and local drug supply detection.
- **Suspected medetomidine overdoses** resembled opioid overdoses (e.g., bradycardia, sedation, unresponsive, altered mental status, blue/gray skin/lips) but often required multiple naloxone doses and prolonged monitoring; management remained largely supportive and symptom-driven.

- **Suspected medetomidine withdrawal** was described as more severe, prolonged, and difficult to manage, frequently requiring ED or intensive care unit (ICU) level care, and empirical treatment with adjunctive medications, opioids, and dexmedetomidine. Symptoms included: intractable nausea, vomiting, tremors/shaking or convulsions, hypertension, tachycardia, diaphoresis, anxiety, agitation or delirium.
- PARO reported that while they did not seek medetomidine, it often became the only substance that alleviated symptoms, contributing to early departures from treatment, reluctance to engage, repeated acute care use, and cycles of withdrawal and return to use.
- The complexity of overdose and withdrawal increased healthcare utilization and resource strain, particularly in the hospital setting, contributing to provider burnout and apprehension.
- PRS were identified as critical sources of information, trust and linkage to care.
- Findings underscore the need for stronger surveillance, wide dissemination of medetomidine-related information, and improved cross-jurisdictional and cross-sector coordination.

Objective 5: Overdose spike response findings – Baltimore City

- The overdose spike event on July 10 was suspected to be linked to the illegal benzodiazepine, N-Methylclonazepam. Ten key informants involved in the July 10 overdose spike response were interviewed.
- Interviewees reported overall declines in overdoses and overdose deaths, though certain demographic groups and geographic areas in Baltimore remain disproportionately affected. Expanded community-based overdose prevention services contributed to improved outcomes, while a volatile drug supply and shifting drug composition, driven largely by illegally-made fentanyl (IMF) and other substances such as benzodiazepines, heroin and cocaine continue to increase risk.
- Baltimore has a broad network of low and no-barrier overdose prevention and substance use services, including wraparound supports; however long-term recovery options and integrated mental and behavioral health services remain limited.
- PRS, strong community outreach, and consistent presence by community organizations were major facilitators of care access. Barriers included administrative hurdles, fragmented coordination and care linkage, unstable funding and negative attitudes and believes about PARO.
- The overdose spike response demonstrated strong multisector collaboration, established response protocols, and effective integration of clinical and public health efforts. Flexibility, coordination, credible messengers who had earned community trust, and shared values among response partners enabled rapid mobilization.
- Opportunities for improvement included stronger collaboration between organizations and across state and local government, standardized response protocols, clearer communication pathways, improved inventory control and supply visibility, and better data access and interpretation.
- Lessons learned emphasized the need to sustain momentum beyond crisis periods; deepen trust and collaboration between community, public health and public safety sectors; improve coordination of substance use services; and use data more effectively to guide response.
- Future preparedness will require sustained funding, clearer role definitions, centralized communication pathways, standardized response plans, and continued community presence to strengthen overdose spike response capacity.

Objective 6: Investigate severe symptoms resulting from polysubstance opioid use

- A case definition was developed, and 120 charts were abstracted across two sites in Cecil County and Baltimore City; 90 visits met suspected case criteria for medetomidine withdrawal. Due to the absence of confirmatory testing, no visits met the confirmed case definition.

- Most patients were non-Hispanic White, median age 40, with high prevalences of ambulance arrival and consequent hospital admission; 38% had at least one instance of self-directed discharge.
- Common symptoms included: nausea, vomiting, tachycardia, tremors, hypertension, hypokalemia and leukocytosis – consistent with qualitative findings.
- Treatment focused on opioid withdrawal and symptom management (e.g., ondansetron, hydromorphone, clonidine, gabapentin, dexmedetomidine, benzodiazepines).
- Lack of confirmatory toxicology testing and overlap with opioid/sedative withdrawal, limited medetomidine-specific attribution.
- Medical chart abstraction was valuable for clinical insights on withdrawal symptomology and treatment, but a critical gap remains in the absence of confirmatory laboratory testing.

KEY RECOMMENDATIONS

Objective 1:

- Continue testing and validating the preliminary medetomidine withdrawal syndrome definition.
- Establish anomaly thresholds and consider public reporting via a dashboard to enhance situational awareness.

Objective 2:

- Consider implementing non-fatal overdose biosurveillance, establishing legal authority and governance for it.
- Identify priority areas for targeted implementation using existing data sources and real-time drug trend intelligence.
- Identify laboratory partners capable of confirmatory toxicology testing.
- Determine the analyte panel and communicate it with the laboratory partner. Establish timelines and validation capacity for all analytes. An overdose biosurveillance analyte panel would ideally include a broad range of substances, including common over-the-counter, prescription/therapeutic and illicit drugs.
- Identify hospital partners capable of packaging and sending residual or remnant biological specimens from ED patients to partnering laboratory in a timely manner.
- Communicate the required data elements and ensure that participating hospitals can meet data preparation and submission requirements.
- Establish clear processes for specimen and data transfer, and data integration and dissemination

Objective 3 and 4:

- Adapt overdose response and naloxone protocols to address emerging adulterants, specifically medetomidine, emphasizing appropriate naloxone dosing, rescue breathing, cardiopulmonary resuscitation (CPR), Good Samaritan protections, and post-reversal monitoring.
- Expand overdose and medetomidine-specific education for PARO, families, providers, and communities.
- Enhance clinical awareness and preparedness for emerging drug threats, including medetomidine, across all care settings. Consider formation of clinician workgroups to support best practice development and shared learning.
- Strengthen continuity of care and communication between local and state health departments, as well as communication among care settings. Improve discharge planning, referral pathways and linkage to care.
- Integrate PRS across care settings to provide support for PARO and serve as a bridge between patients and providers.

- Continue to support and expand access to comprehensive care, including medications for opioid use disorder (MOUD), particularly in high-risk settings.
- Sustain community-based engagement and clarify roles between state and local governmental and public health entities. Strengthen overdose surveillance and practice-based learning to improve detection of emerging substances, monitor trends, and inform response efforts.
- Support workforce resilience and reduce burnout.

Objective 5:

- Adapt overdose response and naloxone protocols to address emerging adulterants, emphasizing appropriate naloxone dosing, rescue breathing, CPR, Good Samaritan protections, and post-reversal monitoring.
- Expand overdose education for PARO, families and communities.
- Sustain community-based engagement and clarify response roles between organizations, state and local government.
- Strengthen overdose surveillance and data integration to improve situational awareness and inform response efforts.
- Strengthen overdose spike response infrastructure through standardized protocols, clarified roles, and centralized communication systems.
- Improve communication by developing standardized communication protocols, articulating roles, responsibilities and needs, and clarifying points of contact and communication pathways.
- Improve service coordination and strengthen linkages to care.
- Continue to support and expand access to care, especially in settings where people's vulnerability to overdose is heightened.

Objective 6:

- Strengthen data triangulation, by integrating clinical surveillance data (e.g., chart abstraction, hospital data) with other data sources to improve situational awareness.
- Improve characterization of medetomidine exposure and withdrawal to inform clinical guidance.
- Establish clinician workgroups and strengthen cross-jurisdictional clinician collaboration.

Background

OVERDOSE IN MARYLAND

The overdose epidemic remains a critical public health issue in the U.S., with the National Vital Statistics System reporting 79,384 drug overdose deaths in 2024.[4] Among 46 jurisdictions participating in the CDC's Drug Overdose Surveillance and Epidemiology Syndromic Surveillance (DOSE-SYS) system, the overall monthly suspected non-fatal overdose ED visits involving all drugs were 58.4 and 57.1 per 10,000 total ED visits in July and August 2025, respectively.[5] This crisis was initially fueled by prescription opioids, and has shifted since 2013 to IMF.[6]

In addition to a rapidly evolving illegal drug supply, polysubstance use, which involves consuming multiple drugs simultaneously or in close succession, either intentionally or unintentionally is common.[7] Opioids and IMF are frequently found in combination with substances such as stimulants, benzodiazepines, and novel psychoactive substances (NPS), which standard drug tests often cannot detect. In 2022, nearly half of drug overdose deaths in the U.S. involved multiple drugs.[8] Polysubstance use has been associated with poorer treatment outcomes and increases the risk of fatal overdose.[7]

In 2023, Maryland's age-adjusted occurrent fatal overdose rate was 39.7 per 100,000 residents compared to the overall rate (33.4).[9] More recent data from October 2024 to July 2025 indicates that fatal overdoses continue to be high in Maryland, with 1,133 overdose deaths, of which 902 were related to opioids and 803 were related to fentanyl.[10] From August 2024 to July 2025, non-fatal overdose ED visits involving all drugs were 70.6 per 10,000 total ED visits, with 21.4% related to opioids, followed by stimulants (1.9%).[11] The statewide voluntary drug checking program, Rapid Analysis of Drugs (RAD), which test drug paraphernalia also showed that in 2024, fentanyl and its analogs were the most commonly seen compound and nearly 30-40% of samples each quarter had multiple active ingredients in them.[12,13]

While national fatal overdose rates have been trending downward[14], overdose incidents remain a concern, exacerbated by the emergence of tranquilizers, such as xylazine in 2020[15,16] and, more recently, medetomidine as adulterants in synthetic opioids.[17] Since its initial detection in 2021, medetomidine, a more potent nonopioid sedative than xylazine,[18] has been implicated in overdose outbreaks in cities such as Philadelphia and Chicago.[19,20] In Maryland, xylazine in RAD samples decreased from 37.9% in quarter 1 of 2024 to 22.5% in quarter 4, while medetomidine increased from 0% in quarter 1 of 2024 to 8.4% in quarter 4.[2,13] By quarter 1 of 2025, the medetomidine in RAD samples had increased to 14.1%, with Cecil County seeing highest prevalence (66.7%), followed by Hartford County (20.0%) and Calvert County (16.7%).[2]

Medetomidine is an α2-adrenergic agonist[1] and does not respond to opioid overdose reversal medications such as naloxone. These medications should still be administered, however, due to the likely co-occurrence with IMF. While medetomidine is similar to the dextro-isomer, dexmedetomidine (also known as Precedex)[21], which is used in humans for sedation of mechanically ventilated patients, it has no approved human use. Medetomidine produces several physiological side effects, including sedation, analgesia, bradycardia, prolonged hypotension following initial hypertension and peripheral vasoconstriction.[18,22] The sedation can last for 2-3 hours but may be prolonged when combined with opioids. Furthermore, withdrawal from medetomidine is complex and cannot be managed with standard treatments for opioid use disorder, such as methadone or buprenorphine.[23]

Cecil County

Located in the northeastern corner of Maryland, and bordering Pennsylvania and Delaware, Cecil County has been grappling with its own opioid overdose challenge. From October 2024 to July 2025, Maryland Fatal Overdose data reported that Cecil County had 44 overdose deaths, of which 39 were related to opioids and 37 were related to fentanyl (the two are not mutually exclusive).[10] From 2018 to 2023, the overdose death

rate per 100,000 population in Cecil County (75.4) was higher than statewide (40.6),[24] although both areas have seen a downward trend in recent years (2021-2024).[10] Additionally, the most recent 2022 Community Health Needs Assessment (CHNA) identifies substance use as a top concern.[25] In the 2022 CHNA, local residents and community partners attribute the high overdose rates to opioids and alcohol, limited access to services, and the county's proximity to Interstate-95, which increases drug trafficking from nearby Pennsylvania and Delaware.[25]

In February and March 2025, Cecil County Health Department (CCHD) identified increases in opioid-related overdoses by triangulating several data sources and leveraging their multisectoral partnerships. One of these data sources included local law enforcement data, which helped flag increases in non-fatal and fatal opioid-related overdoses beginning February. Comparing trends in overdose through March 27th of each year, CCHD also noted an increase in both non-fatal and fatal overdoses in 2025 compared to 2024. At the same time, reports from local treatment providers and community-based overdose prevention organizations also flagged changes in client experiences, including increased instances of seizures, "brain zaps" which are described as brief, electric shock-like sensations in the head or body, and other changes in withdrawal symptoms like loss of time and memory. The local hospital also noted patients presenting with more severe intoxication or withdrawal, requiring longer, more intensive intervention. Concurrently, RAD identified medetomidine, the "-caines" & BTMP in Cecil County samples. Overall, a higher percentage of samples from Cecil County contained medetomidine compared to all of Maryland.[2,13]

In response to this increase, a team of representatives from various sectors, including social services, criminal justice, and mental and behavioral health, mobilized on March 14, 2025. This team developed messaging and education resources to inform about medetomidine risks. The team also held consultations and made presentations to raise awareness and share the county's experience with managing and responding to medetomidine. By May 19, 2025, MDH became involved in the response.

Baltimore City

Located about 57 miles away from Cecil County, Baltimore City faces its own unique drug supply and overdose challenges, with the highest opioid-related overdose fatalities (133.4 per 100,000) in the state from 2018 to 2023.[26]**Error! Bookmark not defined.** From October 2024 to July 2025, Maryland Fatal Overdose data reported that Baltimore City had 468 overdose deaths, of which 418 were related to opioids and 383 were related to fentanyl.[10] From 2023-2024, fatal overdoses in Baltimore City appeared to be declining, yet the rate remained higher than the state average. The City of Baltimore Overdose Response Strategic Plan 2025-2027 issued by the Mayor's Office of Overdose Response, indicates that the majority of overdose deaths are linked to IMF and disproportionately affect Black male residents aged 60 and older.[26] Ongoing social and structural issues, such as limited access to housing, healthcare, transportation and care coordination for treatment and recovery, contributed to these high rates.[26]

On July 10, 2025, twenty-seven non-fatal overdoses occurred in the Penn North neighborhood of west Baltimore City. Testing of two syringes collected during neighborhood canvassing detected fentanyl and an illegal benzodiazepine, N-Methylclonazepam.[3] Concentration levels of N-Methylclonazepam were higher than fentanyl, which was irregular for samples where benzodiazepines and fentanyl were co-detected in the area. Other drug paraphernalia (e.g., capsules and glass or plastic vials) tested showed no detectable compounds or only cocaine. No medetomidine was detected. On July 18, 2025, another overdose spike event occurred in the Penn North neighborhood. Drug paraphernalia from the area from this event tested positive for fentanyl and quinine.[3]

EPI-AID TIMELINE AND OBJECTIVES

On June 17, 2025, MDH requested CDC support through an Epidemiological Assistance (Epi-Aid) to investigate the increase in withdrawal symptoms and unusual spikes in overdoses among PARO seeking care in treatment facilities and hospitals in Cecil County, Maryland, suspected to be associated with

medetomidine, with five initial objectives.[1] An Epi-Aid addresses urgent public health issues by enabling rapid responses and providing expertise from the CDC's Epidemic Intelligence Service (EIS) officers and subject matter experts.

As planning for the Epi-Aid progressed, Maryland requested expanding objectives 4 and 5 to include Baltimore City following the overdose spike events on July 10 and July 18, 2025. Some providers in the city reported treating patients suspected of medetomidine exposure; these cases were included as part of the original objectives. However, once we got in the field and confirmed that medetomidine was not implicated in the July 10 or July 18 overdose spike events, MDH and Baltimore City's Mayor's Office of Overdose Response revised Objective 4 to focus on understanding the city's response to the July 10 overdose spike event. As work progressed in the field and analysis was conducted, this focus was formalized as a separate objective (Objective 5), and the original Objective 5 was renumbered as Objective 6.

The objectives of the Epi-Aid were to:

1. Increase capacity to use syndromic surveillance system to monitor changes in withdrawal symptoms, including through case definition and query development, to support building MDH's infrastructure to identify changes in the drug supply.[1]
2. Provide a gap assessment to evaluate and provide recommendations on laboratory testing of non-fatal overdoses.[1]
3. Conduct interviews with PARO and use findings to develop community and first responder guidance for cases involving medetomidine and sedative adulterants.[1]
4. Conduct interviews with clinical response partners in a variety of settings, including hospitals, primary care and specialty behavioral health, and utilize findings to develop guidance for clinical partners.[1]
5. Conduct interviews with response partners from a variety of settings to gain insights into the Baltimore City overdose spike event response on July 10, 2025.
6. Investigate the prevalence, incidence and characteristics of severe symptoms resulting from polysubstance opioid use including sedative adulterants through interviews, medical chart abstraction and other data analysis as available to inform the development of guidance document.[1]

By mid-July, the Epi-Aid team, consisting of four EIS officers, Drs. Nhia Vang, Emilia Pawlowski, Kate Campbell, and Katie McNabb, was assembled with support from scientists in NCIPC's DOP. Starting on July 27, 2025, the team deployed to Maryland for 20 days, visiting Cecil County and Baltimore City to engage with key partners in overdose prevention and response. Drs. Campbell and Pawlowski developed a case definition for medetomidine withdrawal and completed chart abstraction and analysis to characterize medetomidine withdrawal. They also tested and refined a new syndromic surveillance withdrawal syndrome definition. Drs. McNabb and Vang conducted semi-structured interviews with providers from a variety of healthcare settings and with PARO to learn about experiences identifying and managing medetomidine-related withdrawal. Key informant interviews with various community partners involved in the overdose response were completed in Baltimore City. Dr. Vang conducted an environmental scan of Maryland's current systems for overdose biosurveillance, reviewing documents and interviewing key partners and providers to identify gaps and existing resources. Analysis of both quantitative and qualitive work began during the Epi-Aid and continued after returning from the field.

[1] These were the original Epi-Aid Objectives as outlined in the initial request from MDH and were later revised based on emerging findings and final analysis. The scope of the original objectives 1 and 2 was statewide; original objectives 3–5 were limited to Cecil County and related to medetomidine.

IRB/ETHICAL CONSIDERATIONS/APPROVALS

Because this investigation was a public health response, and not research, Institutional Review Board (IRB) approval was not required by CDC or MDH. All secondary data sources, including ED visit data, EMS data and EHR charts were deidentified prior to analysis. All data were stored and analyzed securely on CDC computers.

Objective 1: Use syndromic surveillance to monitor changes in withdrawal symptoms

Objective 1. Increase capacity to use syndromic surveillance system to monitor changes in withdrawal symptoms, including through case definition and query development, to support building MDH's infrastructure to identify changes in the drug supply.

BACKGROUND

To identify and monitor ED visits for suspected medetomidine-involved withdrawal, the Overdose Morbidity Team in the DOP at the NCIPC developed a draft syndrome definition, "Opioid and Psychoactive Substance Withdrawal Syndromic Surveillance Text Query v1.5" (**Appendix A**).

We used Maryland data from the National Syndromic Surveillance Program Electronic Surveillance System for the Early Notification of Community-based Epidemics (NSSP-ESSENCE) to test the draft syndrome definition developed by DOP, addressing the need for improved surveillance and understanding of withdrawal patterns in Maryland. NSSP-ESSENCE enables public health officials to conduct near real-time analysis of healthcare data, facilitating the early detection of unusual patterns in ED visits.

DATA SOURCES AND METHODS

Data Source

Withdrawal-related ED visits were identified using data from CDC's NSSP, which provides near real-time electronic health record (EHR) data on ED visits, often within 24–48 hours. NSSP involves collaboration among state and local health departments, CDC, and other partners, and currently includes 80% of U.S. EDs. ED visits for withdrawal were queried using a syndrome definition that identifies visits through free-text chief complaint fields and discharge diagnosis codes. We report on the characteristics and trends of these visits from Maryland's NSSP program, analyzing data from Q1 (January-March) 2022 through Q3 (July-September) 2025. Groups with a quarterly frequency of less than 8 during any quarter were suppressed and not included on resulting graphs.

Syndrome Definition

The draft syndrome definition used chief complaint terms and discharge diagnoses codes based on inclusion and exclusion criteria:

- **Inclusion criteria:** ICD-10-CM codes for opioid, other psychoactive substance, and sedative abuse, dependence, or use with withdrawal were included from the syndrome definition. Conditional inclusion of opioid overdose codes was also included. Chief complaints mentioning "withdrawal" or related signs and symptoms, which ensured relevant cases were captured across both diagnostic codes and patient-reported information were also included.
- **Exclusion criteria:** ICD-10-CM codes for alcohol and cannabis abuse, dependence, use with withdrawal. or intoxication were excluded from the syndrome definition. Chief complaints mentioning alcohol or marijuana were also excluded. These exclusions helped focus the definition on withdrawal related to substances that we were trying to capture.

We tested the draft syndrome definition using Maryland ESSENCE data. We refined the syndrome definition by adding adjacent words and common misspellings identified to inclusion and exclusion criteria.

- **Adjacent words:** We pulled millions of hospital visits into Python and used the Gensim package to learn patterns from our text data through a machine learning algortihm, turning each word into a set of numbers. Once every word had its own set of numbers, we compared how similar two words were by measuring the angle between their number sets using a method called cosine similarity.

This method helps identify words that are related or have similar meanings. After finding words that were similar using cosine similarity, we reviewed them manually to decide if they were useful or relevant for our purpose. This step helped ensure that the words identified by the computer made sense for our context and met our needs.

- **Misspellings:** To find misspellings of the word "withdrawal" in our text data, we used a computer method called the Levenshtein similarity ratio. This method compares two words and counts how many changes—like adding, removing, or swapping letters—are needed to turn one word into the other. The fewer changes needed, the more similar the words are. We again used the Gensim package to help with this process. We looked at each word in our data and compared it to "withdrawal" using the Levenshtein ratio. If a word was very similar to "withdrawal" (meaning only a few changes were needed), it was likely a misspelling. We then reviewed these words to see if they were misspellings and decided how to handle them. This helped us catch and correct common spelling mistakes in our data.

We identified withdrawal-related ED visits using the updated draft syndrome definition for opioid and psychoactive substance withdrawal. Frequencies and Visit Rates for withdrawal were calculated quarterly, using total ED visits as the denominator and expressed per 10,000 ED visits. Demographic characteristics of the identified visits were analyzed, including calculating quarterly trends and characterizing the visit population by sex, age, and race/ethnicity. Subgroup analyses were conducted to identify high-risk populations based on age, sex, and race/ethnicity. The geographical distribution of withdrawal-related visits across Maryland counties was also examined to identify spatial patterns. R Posit and Jupyter Notebook software were utilized for analyses.

RESULTS

We identified a total of 6,465 withdrawal-related ED visits in Maryland from January 2022 to September 2025. The overall visit rate for withdrawal-related ED visits was 11.44 per 10,000 visits (**Table 1.1**).

Figure 1.1 illustrates the quarterly frequency and rate of withdrawal-related ED visits, showing a noticeable increase during specific quarters. The frequency and rate of withdrawal-related ED visits peaked in the 2nd quarter of 2023, with 574 withdrawal-related ED visits and at a rate of 14.02 per 10,000 visits. **Figure 1.2** presents the quarterly rates of withdrawal-related ED visits per 10,000 visits, showing that males experienced higher rates of withdrawal-related ED visits than females, though patterns of visits were similar. **Figures 1.3** displays the rates by race and ethnicity, where visit rate was highest among White and non-Hispanic persons. **Figure 1.4** illustrates rates by age group, where rates were highest among 25-34 and 35-54 year olds.

The analysis of rates for the overall study period showed significant differences in visit rates between sexes (**Table 1.1**). The withdrawal-related ED visits rate for females was 8.29 per 10,000 visits, while the rate for males was 15.23 per 10,000 visits. The calculated rate ratio indicated that males experienced a 1.84 times higher rate of visits compared to females, with a 95% confidence interval (CI) of (1.83, 1.85).

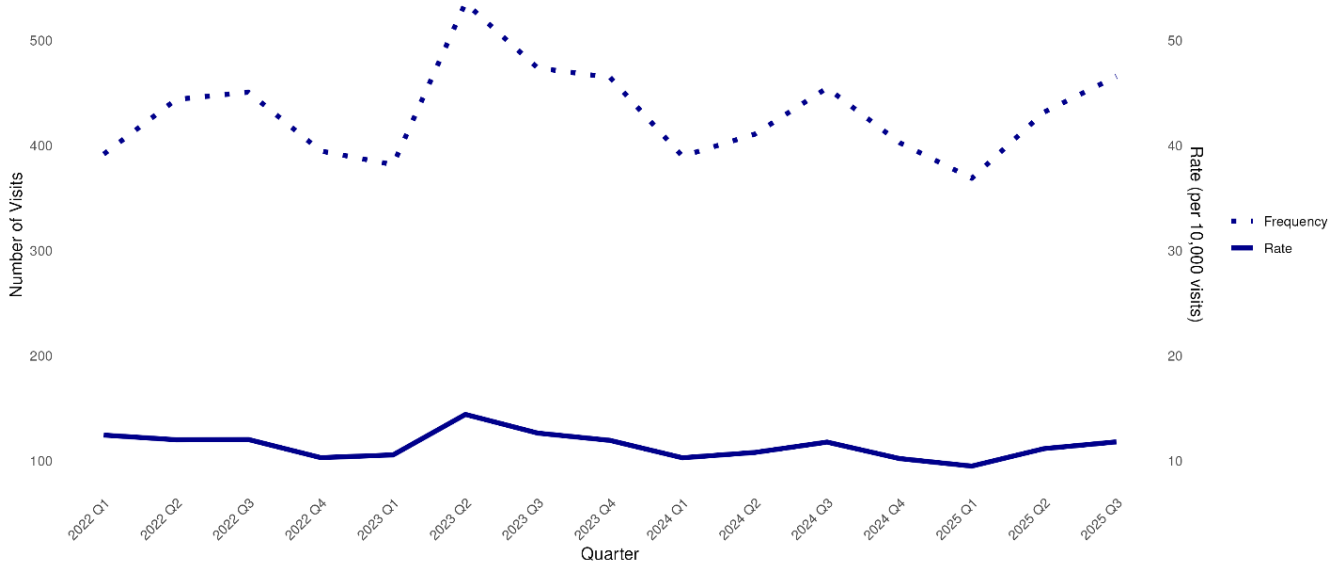
In terms of race and ethnicity, the withdrawal-related ED visit rates varied among different groups. The visit rate for Multiracial and Other non-Hispanic individuals was 3.56 per 10,000 visits and was used as the referent for calculating rate ratios. The withdrawal-related ED visit rates for Black or African American individuals, Hispanic or Latino individuals, and White individuals were 10.63, 6.91, and 14.27 per 10,000 visits, respectively. Rate ratios indicated that Black or African American individuals had a 2.98 times higher rate of visits compared to Multiracial and Other non-Hispanic individuals (95% CI=2.95, 3.02). Similarly, Hispanic or Latino individuals had a rate ratio of 1.94 (95% CI=1.88, 2.00) and White individuals had a rate ratio of 4.00 (95% CI=3.96, 4.04) compared to the referent group.

Age-based analysis showed significant differences in visit rates across different age groups. The "55 or older" age group had a visit rate of 7.50 per 10,000 visits, which was used as the referent for calculating rate

ratios. The visit rates for the younger age groups were as follows: 9.77 for ages 15-24, 20.93 for ages 25-34, and 18.94 for ages 35-54. The rate ratios indicated that individuals aged 25-34 had a 2.79 (95% CI=2.77, 2.81) rate of visits compared to those aged 55 or older. Similarly, the rate for individuals aged 35-54 was 2.53 (95% CI=2.51, 2.54) times higher. Individuals aged 15-24 had a rate ratio of 1.30 (95% CI=1.28, 1.32) compared to the referent group.

The map illustrating the frequency of withdrawal visits by patient zip code over the study period shows that some of the most heavily impacted zip codes lie along the I-95 corridor (**Figure 1.5**). This geographic concentration suggests a potential correlation between location and the prevalence of withdrawal-related visits.

Figure 1.1. Quarterly Trends in Maryland Withdrawal-Related ED Visits: Frequency and Rate, NSSP, January 2022–September 2025[2]



[2] Q1 = Jan–Mar; Q2 = Apr–Jun; Q3 = Jul–Sep; Q4 = Oct–Dec.

Figure 1.2. Quarterly Trends in Maryland Withdrawal-Related ED Visits: Rates by Sex, NSSP, January 2022–September 2025[2]

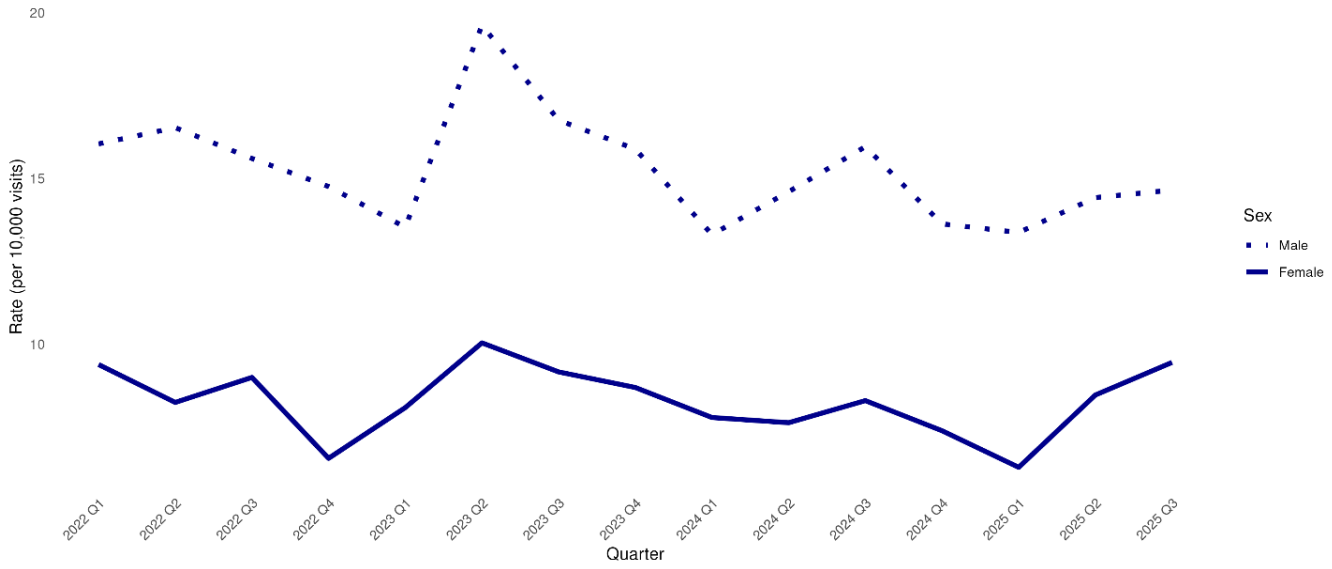
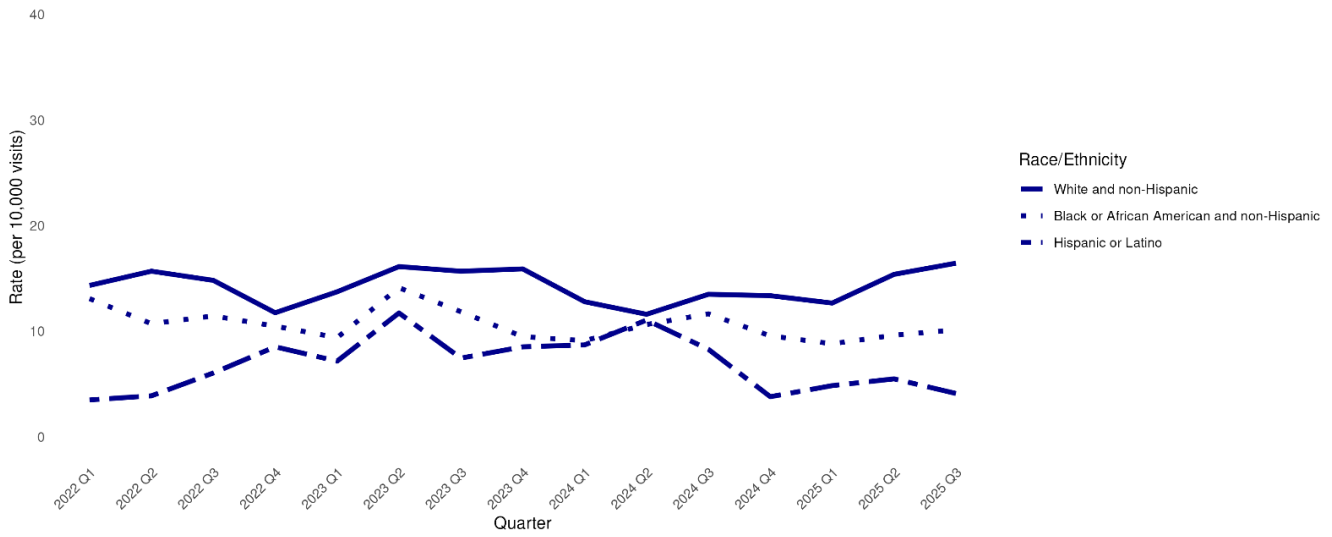


Figure 1.3. Quarterly Trends in Maryland Withdrawal-Related ED Visits: Rates by Race/Ethnicity, NSSP, January 2022–September 2025[3],[4]



[3] Q1 = Jan–Mar; Q2 = Apr–Jun; Q3 = Jul–Sep; Q4 = Oct–Dec.

[4] The Multiracial and Other non-Hispanic group is not shown in quarterly graph due to data suppression.

Figure 1.4. Quarterly Trends in Maryland Withdrawal-Related ED Visits: Rates by Age Group, NSSP, January 2022–September 2025[3]

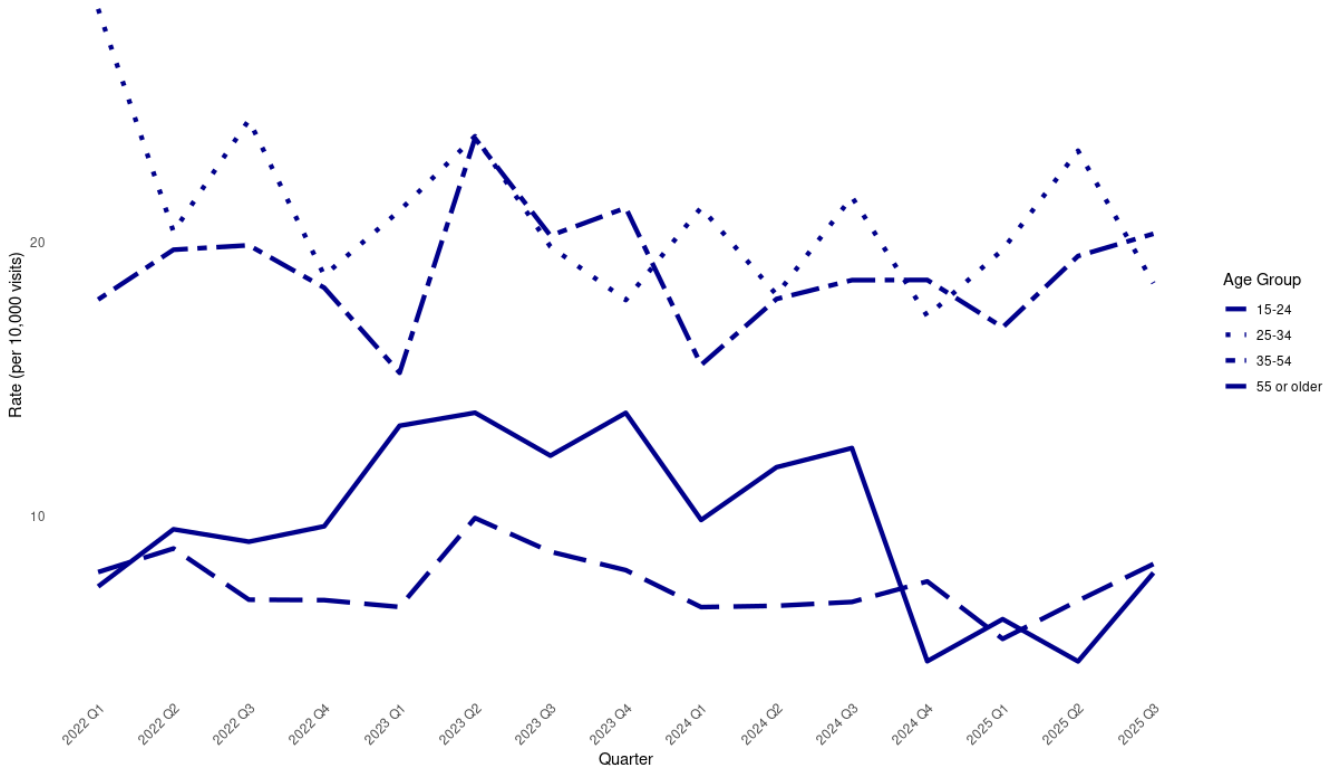


Table 1.1. ED visits for withdrawal[5] **per 10,000 total visits and visit ratios, by selected characteristics — NSSP, Maryland, January 2022–September 2025**

Characteristic	**Visit Rate (per 10,000)**[6]	**Rate Ratio**[7]
Overall	11.44	-
Sex		
Female	8.29	Ref
Male	15.23	1.84 (1.83, 1.85)
Race and Ethnicity		
Multiracial and Other non-Hispanic	3.56	Ref
Black or African American and non-Hispanic	10.63	2.98 (2.95, 3.02)

[5] Q1 = Jan–Mar; Q2 = Apr–Jun; Q3 = Jul–Sep; Q4 = Oct–Dec.
[6] (Number of ED visits for withdrawal / total number of ED visits) x 10,000.
[7] (ED visits for withdrawal [comparison group] / all ED visits [comparison group]) / (ED visits for pedestrian injury [Ref] / all ED visits [Ref])

Characteristic	Visit Rate (per 10,000)[6]	Rate Ratio[7]
Hispanic or Latino	6.91	1.94 (1.88, 2.00)
White and non-Hispanic	14.27	4.00 (3.96, 4.04)
Age Group		
15-24	9.77	1.30 (1.28, 1.32)
25-34	20.93	2.79 (2.77, 2.81)
35-54	18.94	2.53 (2.51, 2.54)
55 or older	7.50	Ref

Figure 1.5. Maryland Withdrawal ED Visits by Patient Zip Code[8]

DISCUSSION

In this investigation, we identified significant disparities in withdrawal-related ED visits across various demographic groups, including sex, race/ethnicity, and age. The findings highlight that males and certain racial/ethnic groups, such as White and Black or African American individuals, experienced higher visit rates. Additionally, the geographic analysis revealed that the most heavily impacted zip codes were concentrated along the I-95 corridor, indicating potential areas for targeted public health interventions. These results underscore the importance of enhancing syndromic surveillance systems to effectively monitor and address the evolving patterns of withdrawal-related visits.

Testing of this preliminary syndrome definition demonstrates its potential as a valuable resource for identifying and responding to changing trends in withdrawal symptoms, which may indicate broader shifts in the drug supply. While our work primarily focused on withdrawal syndrome in Cecil County, unusual withdrawal symptoms are not confined to this area; they are also observed in other regions along the I-95 corridor. It is crucial to recognize that patients often travel outside of Cecil County for care, making it essential to consider developments in other parts of Maryland. This emphasizes the need to maintain open

[8] Q1 = Jan–Mar; Q2 = Apr–Jun; Q3 = Jul–Sep; Q4 = Oct–Dec.

lines of communication and collaboration between jurisdictions across the state through MDH or by leveraging other existing channels.

RECOMMENDATIONS

1. Continue to test and validate syndrome definition

We recommend continued testing and refinement of the syndrome definition through collaboration with partners in other jurisdictions, utilizing resources from the NSSP Community of Practice on ESSENCE query development and revision. This ongoing evaluation will allow for validation with other states and enable necessary revisions as trends emerge and feedback is provided. Resources:

- NSSP ESSENCE Query Development and Revision
- NSSP Community of Practice

2. Establish anomaly thresholds and consider public reporting via a dashboard to enhance situational awareness

The same considerations using syndromic surveillance for detection of overdose anomalies can possibly be applied for detection of withdrawal-related anomalies. Resources:

- CSTE Overdose Anomaly Toolkit: State Syndromic Surveillance System

We recommend that withdrawal data be shared publicly as part of a comprehensive dashboard system once the syndrome definition has been validated. This approach would enhance transparency, facilitate access to critical information for partners, and support data-driven decision-making in public health. By providing near real-time insights into withdrawal trends and characteristics, a publicly accessible dashboard could improve community awareness, inform targeted interventions, and foster collaboration among health departments, researchers, and the public.

LIMITATIONS

Medetomidine exposure and withdrawal do not have unique ICD-10-CM codes, and confirmatory toxicology testing is not routinely conducted in EDs. Many distinguishing characteristics of medetomidine withdrawal relate to symptom severity or vital sign abnormalities that are not well-captured in discharge diagnoses or chief complaint fields.

Objective 2: Gap assessment for overdose biosurveillance

Objective 2. Provide a gap assessment to evaluate and provide recommendations on laboratory testing of non-fatal overdoses.

BACKGROUND

This objective focuses on assessing the statewide overdose surveillance infrastructure, biosurveillance capacity, and gaps in identifying substances in the drug supply. Overdose biosurveillance is the analysis of biological specimens, such as blood and urine, from non-fatal overdose ED visits for drug detection and characterization to support public health surveillance.

DATA SOURCES AND METHODS

We conducted an environmental scan of current statewide resources guided by the Association of Public Health Laboratories (APHL) Model Opioids Biosurveillance Strategy for Public Health Practice[27] and the Expanded Biosurveillance Strategy for Public Health Practice.[28] The components reviewed included:

- **Public health and community infrastructure**
  - Epidemiological and laboratory infrastructure
  - Reportable condition regulations
  - Overdose-related community groups and activities
- **Current surveillance infrastructure**
  - Hospital ED-based reporting
  - Emergency medical services (EMS)
  - Poison control data
  - Mortality data
  - Law enforcement and forensic toxicology
  - Drug check programs
- **Additional insights from key informants**

Methods included document reviews and key informant interviews with seven informants across local and state government, hospital, and academia. Each interview lasted approximately 30 minutes and was not recorded; extensive notes were taken instead. Informants were asked about their current roles and responsibilities, laboratory testing capabilities, identified gaps and challenges, and their awareness of and interest in biosurveillance, including recommendations. We synthesized the information extracted from the document reviews and key informant interviews. First, we described the current components and summarized their limitations. We then described findings from the interviews. Next, we present gap analysis findings, comparing Maryland's current resources to APHL best practices. Finally, we made recommendations based on Maryland's resources and priorities.

RESULTS

Maryland has several existing systems for overdose-related surveillance, but none provide confirmatory toxicology testing and identification of the substances in non-fatal overdoses. These systems could be complemented by non-fatal overdose biosurveillance.

1. Current Public Health and Community Infrastructure

These components represent the systems, partnerships, and intervention points where surveillance data is integrated and utilized for action, establishing the baseline foundational capability for biosurveillance that can be leveraged for effective implementation.

1.1. Epidemiological & laboratory infrastructure

Maryland's public health system operates under a shared governance model, consisting of MDH and 24 Local Health Departments (LHDs). With 18 of the 24 jurisdictions being rural, this model grants LHDs autonomy while enabling statewide coordination and flexibility to tailor strategies to local needs.[29] The state's efforts to address the overdose crisis are centrally coordinated by the MDH Office of Overdose Response.

- **Epidemiology**: Maryland possesses a strong epidemiological infrastructure, particularly at the state and in larger LHDs, capable of collecting, analyzing, and interpreting population-level overdose data. MDH disseminates information about trends and variations through the Maryland Overdose Dashboard, which highlights statewide trends on fatal overdoses, ED-related overdose visits, naloxone distributions and administrations. However, the overall shortage of epidemiologists presents a significant constraint, particularly at the local level. Only half of LHDs have a dedicated epidemiologist or statistician, which can limit local capacity for data management, analysis, and interpretation of trends.[29]
- **Laboratory:** The MDH Laboratories Administration provides statewide diagnostic services critical for public health surveillance, identifying and detecting diseases, disorders, and chemical agents.[30] It works with epidemiologists to link these results with existing public health data. The MDH Laboratories Administration is a participant in the national Laboratory Response Network (LRN), operating as an Advanced Level laboratory for biological threats (LRN-B) and a Level 2 laboratory for chemical threats (LRN-C). As a Level 2 LRN-C, it maintains testing capabilities for exposure to chemical terrorism agents (e.g., cyanide, toxic metals, and industrial chemicals). It also has basic instrumentation, including liquid chromatography-tandem mass spectrometry (LC-MS/MS), which supports definitive toxicology testing. Existing MDH couriers handle specimens for microbiology and newborn testing. LRN participation also demonstrates established experience in surge protocols, quality assurance and control, and incident response.

1.2. Reportable conditions regulations

Reportable diseases and conditions are those legally mandated to be reported by providers to state or local public health authorities due to the condition's public health significance (contagiousness, severity, or frequency). The list is periodically updated and varies across jurisdictions. Maryland's current regulations cover over 80 communicable diseases, outbreaks, and unusual manifestations, capturing key demographic, laboratory, exposure, and clinical information.[31]

Most reports go to LHDs, often immediately or within one working day. Established, well-understood reporting pathways between LHDs and MDH support rapid detection and response, with the public health workforce trained in case reporting, data management, and public health action. This system also enables the early detection of changes in disease effects and trends, supports data-driven decision-making by facilitating planning, hotspot identification, and targeted interventions, and assesses control and prevention measures to inform public health strategies and policies. Drug overdoses are not currently included as reportable conditions in Maryland. Some states mandate reporting of non-fatal overdoses, allowing biosurveillance programs to be classified as public health surveillance or investigation without needing IRB approval.

1.3. Overdose-related community groups and activities

Efforts to reduce overdose are centralized at the MDH Behavioral Health Administration, Office of Overdose Prevention and Education (OOPE). OOPE oversees key programs including Overdose Response Programs (ORPs), Opioid Associated Disease Prevention and Outreach Programs (OADPOPs), Rapid Analysis of Drugs (RAD), and related grants and workforce initiatives.[32]

- **OADPOPs** MDH authorizes 29 OADPOPs across 20 counties, operated by LHDs or community-based organizations.[33] These programs provide health-promoting services to PARO, including

naloxone and test strip distribution, drug paraphernalia testing through RAD, medical services and equipment access, linkages to care and peer recovery support. OADPOPs are valuable resources for gathering timely, anecdotal information regarding new substance use trends and are effective mechanisms for disseminating public health information.

- **ORPs**: MDH also authorizes governmental or community-based organizations to operate as ORPs, which focus on overdose prevention education and naloxone dispensing.[34] ORPs contribute valuable data on the distribution of supplies and recipients. Altogether, MDH's efforts provide essential community-based data and establish a pathway for low-barrier intervention and community engagement.

1.4. Limitations

Despite strong state epidemiology resources, LHDs have limited capacity for independent data management, complex analysis, and interpretation of emerging trends. Ongoing overdose biosurveillance will require consistent, dedicated epidemiologic expertise for data collection, analysis, interpretation, and dissemination. While the MDH Laboratories Administration has baseline instrumentations and LRN/public health surveillance experience, leveraging this for overdose biosurveillance will need dedicated planning and resources. It is also unclear whether overdose biosurveillance falls under existing public health authority to collect and test specimens, despite precedent for related activities. Finally, community groups play a crucial role in services, engagement and sharing substance use and resource utilization data, but they are not positioned to collect or test biological samples. Drug checking through these groups remains the most appropriate approach, and access to overdose biosurveillance data could strengthen drug checking results and help PARO make more informed decisions.

2. Current Surveillance Infrastructure

Some components provide timely, geographic, and incidence-based data on overdose events as they happen but lack laboratory drug identification. Other components provide confirmed identification of substances, primarily post-mortem, for legal purposes or from voluntary drug paraphernalia testing.

2.1. Hospital ED-based reporting data (ESSENCE)

The Electronic Surveillance System for the Early Notification of Community-based Epidemics (ESSENCE) captures hospital ED-based data from 49 facilities statewide, typically within 24 hours of an ED visit.[35] Integration with ESSENCE allows the Drug Overdose Surveillance and Epidemiology (DOSE) team to analyze suspected non-fatal overdose trends using syndromic definitions, which are based on patient chief complaints and discharge diagnoses. ED-based data serves as a critical early warning, improving situational awareness and alerting public health officials to potential outbreaks or changes in drug overdose-related ED visits. While timely, the data captured by ESSENCE often lacks definitive testing.

Hospitals generally rely on presumptive drug panels that screen for common drugs of misuse (e.g., barbiturates, fentanyl, cocaine, cannabis). Some facilities may perform medical drug testing for monitoring purposes (e.g., SUD treatment compliance). Any testing outside the standard in-house panel requires sending a specimen to a commercial laboratory. Turnaround time is usually within 48 hours, which is often neither timely enough nor required for patient treatment. These external laboratories may have limitations on the substances they can test, and costs can be a significant barrier. For example, a single specialized test, such as a qualitative urine test for medetomidine, can cost around $90, as reported by Cecil County's hospital to Atlanta Diagnostic Laboratories (ADL).

2.2. EMS data (MIEMSS/eMEDS)

The Maryland Institute for Emergency Medical Services Systems (MIEMSS) oversees the statewide EMS system, which is organized into five regions with 27 jurisdictional EMS programs that cover all counties.[36] The electronic Maryland EMS Data System (eMEDS) serves as the statewide prehospital reporting platform. eMEDS data is crucial for overdose surveillance due to its near-real-time integration with key platforms:

- **ESSENCE**: EMS data captures the number of EMS calls, acuity level upon EMS arrival, transport utilization, and naloxone administration encounters. It also captures people who are treated but refuse transport to the ED. As with hospital ED-based, the DOSE team is able to analyze trends using built-in syndromic definitions. This data provides timely surveillance of naloxone administrations, which serves as a proxy for suspected opioid overdoses and treatment, informs mortality reduction strategies, and provides insights into overdose events that warranted EMS intervention, high-burden areas, potential demographic risk factors, and how first responder resources are being utilized.
- **ODMAP**: EMS data also feeds into the Washington/Baltimore High Intensity Drug Trafficking Area (HIDTA) Overdose Detection Mapping Application Program (ODMAP). ODMAP tracks near-real-time suspected fatal and non-fatal overdoses through four required data points: date/time of incident, location, outcome (fatal or non-fatal), and whether naloxone was administered.[37] This enhances situational awareness for local jurisdictions, alerting them to possible overdose spikes and drug trend changes. ODMAP can also alert neighboring jurisdictions to potential overdose events.

2.3. Poison control data

The Maryland Poison Center (MPC) provides 24/7 clinical guidance on poisonings, including drug overdoses, for Maryland and the District of Columbia.[38] MPC data can be an asset to overdose surveillance through two primary data pathways:

- **Local Integration (ESSENCE):** MPC data is transmitted daily and integrated into ESSENCE, covering all jurisdictions. MPC collects data on demographics, exposure details, circumstances and substances involved in poisonings and overdoses. Individuals are encouraged to anonymously report naloxone administration to MPC. With follow-up capability, MPC also captures medical outcomes. Built-in syndromic definitions are used to perform rapid querying, enhancing early detection and situational awareness. MPC supports public health responses by publishing educational materials, alerts or fact sheets which can be distributed via email or the Health Alert Network (HAN). While MPC does not conduct laboratory testing, it regularly receives inquiries about testing biological materials from overdose cases. MPC has worked with the Office of the Chief Medical Examiner (OCME) to coordinate drug toxicology testing through DEA TOX.
- **National Aggregation (NPDS):** As part of America's Poison Centers, MPC contributes de-identified data to the National Poison Data System (NPDS). NPDS is the national surveillance system that aggregates data from the 53 poison centers, covering the entire United States. Poison control data tracks key variables, including demographics, substances, substance categories, clinical effects, exposure circumstances, and clinical management strategies.[39] NPDS supports near-real-time monitoring, surveillance, and response for trends, adverse exposure events and shifts in substance categories and clinical effects, especially when patients are experiencing atypical symptoms or an unusual drug is involved.

2.4. Mortality data (medical examiners' investigations and fatality review boards)

OCME investigates suspected drug-related deaths statewide and conducts comprehensive drug toxicology testing at the performing medical examiner's discretion. The testing covers therapeutic drugs and substances of misuse (including medetomidine), with additional targeted tests as needed. Most testing is in-house; samples are sent to external laboratories when further analysis is required. Local forensic investigators, on behalf of the OCME, can investigate suspicious deaths and collect biological samples for toxicology testing when drug involvement is not suspected, and no autopsy is required. Suspected drug-related deaths are referred to OCME in Baltimore City.[40] Local overdose fatality review boards operate in 23 of 24 jurisdictions, using case characteristics and circumstances to identify risk factors, service gaps, and prevention opportunities.[41]

Mortality data are integrated into the Maryland Overdose Dashboard and the State Unintentional Drug Overdose Reporting System (SUDORS). Although grouped into broad substance categories, mortality data provide definitive post-mortem identification of substances, alongside details on the characteristics and circumstances of overdose deaths, enabling monitoring of both statewide and national trends.

2.5. Law enforcement and forensic toxicology laboratory drug identification

The Controlled Dangerous Substances (CDS) Unit within the Chemistry Section of the Maryland State Police Forensic Sciences Division (MSP FSD) focuses on identifying drugs in seized evidence (e.g., powders, pills, residues), while the Toxicology Unit analyzes blood specimens for the presence of alcohol and drugs.[42]

Maryland also utilizes established public health and public safety partnerships to exchange real-time drug intelligence, including the Overdose Response Strategy (ORS), which facilitates collaboration between Drug Intelligence Officers (DIOs) and Public Health Analysts (PHAs).[43] DIOs can provide non-fatal drug use trends, seizure information, and tactical intelligence to inform public health responses. Techniques such as Fourier-Transform Infrared (FTIR) or high-pressure mass spectrometry (HPMS) have been used for rapid in-field testing of samples. These methods are advantageous due to their speed, portability, low cost, and large libraries, allowing for quick, presumptive identification of seized substances at the scene.[44] Seizure data can offer near-real-time insight into the illicit drug supply entering the state and other related illicit drug trends. Changes in drug seizure data can also correlate with fatal overdoses.

2.6. Drug-checking program

MDH partners with OADPOPs overdose prevention service programs to implement the voluntary RAD program, which provides near-real-time data on community drug samples.[12,45] Currently, 17 of 24 OADPOPs across 11 jurisdictions participate. PARO may bring paraphernalia for drug composition testing; items are wiped and mailed to the National Institute of Standards and Technology (NIST) for analysis using Direct Analysis in Real Time Mass Spectrometry (DART-MS). This technology detects a wide range of substances, including trace residues of both common and emerging substances. Results are typically returned to OADPOPs within 48 hours and may be shared individually with participants or reported in aggregate. Quarterly reports are published on the MDH RAD website. No personal or health information is collected, and there are no sample limits.

Locally, in collaboration with Johns Hopkins University, Baltimore City has the state's first point-of-care drug checking program, *Check It!*. This mobile, van-based service uses FTIR to test samples, and provides results and education to participants within 20 minutes.[46]

Drug checking supports informed decision-making, and is associated with reduced use when results, especially fentanyl or unexpected substances, are detected.[47] Aggregated data also provides timely insight into trends and shifts in common illicit drugs or emerging substances in the illicit drug supply.[45]

2.7. Limitations

Near-real-time overdose surveillance supports timely and location-based understanding of suspected non-fatal overdose-related trends but suffers from a lack of substance specificity. The specific substances involved are often inferred or unknown. Syndromic definitions also often rely on presumptive diagnoses, provider impressions, and patient reports, rather than confirmed toxicology results. Additionally, discharge diagnosis codes are preliminary and may not accurately reflect a patient's final diagnosis. Reliance on proxies can lead to misclassification of events, underestimate overdose events, or miss polysubstance involvement.

Mortality data have several limitations. Delays in final toxicology reports and OCME certification can hinder near-real-time surveillance, leading to an initial underestimation of substance trends. In rural areas, transportation delays can degrade post-mortem specimens, reducing the accuracy of toxicology and obscuring substance detection. Testing is further constrained by advanced decomposition,

skeletonization, or limited sample volume, which may restrict or preclude analysis. Interpretation is also limited by the frequent lack of pre-mortem clinical history or seized drug materials. Additionally, OCME toxicology panels typically target known substances and may miss novel or uncommon analytes.

Drug checking and seizure data also have limitations. Limited availability and voluntary participation in drug checking reduce sample size and generalizability. Distrust among PARO, particularly concerns about prosecution despite confidentiality protections, may further limit uptake.[47] Additionally, 48-hour turnaround times can delay timely decision-making and reduce the likelihood that individuals return for results. Neither data source necessarily reflects what individuals actually ingest, and rapid in-field tests can be inconclusive when compounds are present at low levels. Inconsistent bidirectional data sharing between law enforcement and public health further weakens comprehensive surveillance and strain relationships over privacy and the balance between public health and public safety.

3. Additional Insights from Key Informants

Key informants offered perspectives from those actively engaged in current systems, care practices or communities. They are valuable in assessing existing resources, gauging interest in overdose biosurveillance, and informing implementation planning.

3.1. Key challenges

- **Volatile drug market and localized trends**. Key informants emphasized a volatile, rapidly changing drug supply and limited context around non-fatal overdoses. They also noted three regionally-defined drug markets, each requiring a tailored approach.
- **Data concerns.** Interviewees highlighted concerns of OCME transport delays in rural areas (e.g., 3–5 hours from Cecil County to Baltimore City) leading to potentially degraded specimens and obscured toxicology findings. For example, medetomidine was prevalent in Cecil County's drug supply yet rarely detected postmortem, prompting doubts about testing accuracy, biological sample correlation, and its fatal impact. They also discussed loss of initial specimens after prolonged hospitalization, reducing the ability to confirm substances involved. They emphasized that timely access to non-fatal data would improve drug use trends, targeted interventions and better align toxicology panels with real-time drug supply.
- **Previous overdose biosurveillance efforts.** Interviewees highlighted lessons from the Maryland Emergency Department Drug Surveillance (EDDS) System, which partnered with 20 hospitals to collect de-identified EHR data and conduct urine drug screening to improve insights into drug exposures and inform hospital drug screening panels. EDDS was research-focused, limited in sample capacity, and may have missed high-risk areas. Though inactive, EDDS demonstrates infrastructure and partnerships that could be leveraged for overdose biosurveillance.
- **Laboratory testing in hospital settings.** Testing for new and emerging substances is constrained. Hospitals can incur additional costs and time as specimens need to be sent out to commercial laboratories. While not necessary for immediate care, expanded laboratory data would improve understanding of non-fatal overdose burden and hospital planning, especially for staffing and resources to manage surges or atypical presentations as in the case of medetomidine-suspected withdrawal. Interest from hospital partners for overdose biosurveillance is promising, but funding for packaging/shipping and engagement with leadership are essential to garner support.
- **Laboratory testing at MDH Laboratories Administration.** Interviewees voiced concerns about MDH Laboratories Administration's capacity to lead overdose biosurveillance owing to:
    - Funding constraints and staff shortages that impede baseline functions and make new work infeasible.
    - Inability to meet requirements for space, calibration, quality assurance and control standards,
    - Unclear regulatory compliances for drug testing, analytes and specialized equipment

- Advancing the initiative will require detailed specifications, stable funding, and staff buy-in, plus clear articulation of need and burden.

3.2. Perspectives on overdose biosurveillance

Overall, interviewees emphasized that timely understanding of drug exposure is crucial for improving patient care and reducing drug-related health risks. The perceived value of individual laboratory testing varied by setting: hospitals viewed it as supplementary, while outpatient providers considered it essential for managing SUDs. Although overdose biosurveillance is not intended to improve individual clinical care, from a population health perspective there is broad support for its ability to:

- Enhance identification of new or emerging substances causing severe or atypical illnesses
- Identify the substances contributing to non-fatal overdoses
- Improve understanding of burden, risk factors and trends, identifying high-risk populations
- Inform planning, prevention, response, and interventions amid a volatile drug supply
- Address overdose surveillance gaps by linking data (e.g., nonfatal and fatal) to provide a fuller picture of substances in use and support timely updates to toxicology panels.

Many recommended prioritizing biosurveillance by geography aligned to Maryland's distinct drug markets or areas with highest needs. They also emphasized strengthening collaboration across jurisdictions, organizations and sectors, including academic centers, to improve data, understanding of burden, and better address substance use.

4. Gap Analysis

The following gaps (**Table 2.1**) highlight the transition needed to establish a successful non-fatal overdose biosurveillance program aligned with best practices from APHL. **Appendix B** is a diagram of what the biosurveillance process could look like.

Table 2.1.

Domain	Maryland Current State	APHL Best Practice	Gap
Legal Authority	Drug overdoses are not currently included in list of Reportable Conditions. Several legal frameworks exist for overdose prevention services (e.g., RAD, ORP, OADPOP) and public health investigations.	Some states mandate reporting of non-fatal overdoses. Overdose biosurveillance programs are characterized as public health investigations or surveillance and do not require IRB approval.	Without legal authority, hospitals are not compelled to dedicate resources to specimen retention and submission.
Partner engagement	Strong epidemiological, analytical chemistry, and toxicology capabilities, supported by established multidisciplinary and community partnerships. Strong high-level collaboration exists for policy/programs (e.g., ORS, OOR, OOPE) and for conducting public health surveillance (MDH).	Effective biosurveillance requires multidisciplinary partnerships (epidemiology, analytical chemistry, clinical medicine), maximizing community input from a diverse array of trusted partners, and enabling bidirectional data sharing.	Partnerships are often one-way, but a bidirectional approach linking MDH, LHDs, MPC, public safety, hospitals, and community organizations would create a multidisciplinary loop where data from each groups informs testing panels, drug landscape, and results guide targeted local interventions.

Existing Surveillance Systems	ED/EMS provides non-fatal overdose surveillance. Data often relies on presumptive diagnosis and chief complaint text and lacks substance identification. OCME (SUDORS), forensic/seizure data and RAD data provide laboratory testing and insights to illicit drug supply.	Integration of existing systems with biosurveillance to complement current efforts.	Current systems are siloed, and key data rely on presumptive diagnoses or preliminary data. Lack of confirmatory toxicology testing or identification of ingested substances may miss overdoses cases.
Specimen Acquisition	Most hospitals send non-standard toxicology screens to commercial labs; residual samples are often discarded rapidly. Hospitals may not have materials for shipping and packaging. 18 of 24 jurisdictions are considered rural.	Standardized, low-burden protocol and MOUs/MOAs for collecting and submitting residual specimens from ED to partner lab. Equitable time-sensitive specimen transport across all 24 LHDs with required minimum data elements.	Absence of a protocol or MOU/MOA to flag, hold, and prepare residual samples, resulting in specimen disposal. Difficulty establishing cost-effective, time-sensitive specimen transport from rural hospitals and the inability to collect the necessary minimum data compromise the utility.
Specimen Testing Capability	MDH Laboratories Administration has base instrumentation (LC/MS/MS), existing courier access, and access to TOM Kits but has no experience with overdose biosurveillance. Forensic (MSP FSD) and OCME labs are separate entities focused on legal and death investigation.	Integration of MDH Laboratories Administration as the designated hub for toxicology testing, utilizing LC/MS/MS and non-targeted analysis like High-Resolution Mass Spectrometry (HRMS) to identify emerging novel substances.	No current public health laboratory capacity designated for biosurveillance. Critical gaps exist in technical knowledge (calibration, quality control standards), regulatory/licensing requirement, or personnel/funding. External laboratory partner needs to be identified.
Data Integration and Reporting	Overdose data is siloed: syndromic, RAD, law enforcement/forensic and mortality, but efforts are being made to consolidate (Maryland Overdose Dashboard). Privacy and confidentiality concerns exist but MDH has experience with	Routine, aggregate sharing of laboratory findings back to participating EDs and local LHDs to inform real-time public health interventions Minimum data elements are required, including metadata.	Lack of formal mechanism to link forensic/seizure intelligence with MDH lab testing priorities, and failure to return laboratory results to hospitals to incentivize continued participation. Without minimum data elements, proper

	collecting and protecting personal and health information.		interpretation and aggregation of data is not possible.

DISCUSSION

Maryland has several existing systems and partnerships that support robust overdose prevention activities and surveillance and understanding of the illicit drug landscape. However, there is no routine confirmatory toxicology testing and identification of the substances involved in non-fatal overdoses. While systems such as ESSENCE and ODMAP identify where overdoses occur, the substances driving non-fatal events are largely inferred from mortality toxicology, law enforcement seizures, or drug checking (e.g., RAD).

In an increasingly volatile, polysubstance drug market, timely laboratory-confirmed data on non-fatal overdoses would strengthen public health surveillance, prevention, and response, particularly by identifying emerging substances and those associated with severe or atypical clinical presentations.[27,28,48,49] Although overdose biosurveillance reflects substances present at hospitalization, which may differ from what individuals believe they used and may not always capture the precipitating substance, it remains valuable for tracking drug use patterns, improving clinician awareness of ingested substances, assessing the impact of overdoses and related healthcare utilization, identifying high-risk populations and areas, and capturing cases missed by syndromic surveillance.[48,49] Given Maryland's existing infrastructure that can be leveraged for the implementation of overdose biosurveillance and demonstrated need[5,9,10,25,26], the state is well-positioned to implement overdose biosurveillance.

RECOMMENDATIONS

1. Consider implementing overdose biosurveillance and determine legal authority

Maryland may consider the following in implementing overdose biosurveillance:

- Confirm the legal authority for collecting and analyzing specimens for non-fatal overdose biosurveillance—usually, such activities are considered public health surveillance and generally do not require IRB approval.
- Communicate the public health authority to potential hospital partners—MDH could establish non-fatal overdose as a reportable condition, requiring submission of residual specimens to reduce legal ambiguity.

By leveraging the existing reporting system, which already facilitates reporting of conditions of public health concerns, timely information can be shared among healthcare providers treating cases, LHDs responsible for public health interventions, and MDH, which can disseminate information and guidance across jurisdictions. This approach would enhance communication regarding outbreaks and provide early indications of changes in the drug supply by increasing the detection of unusual signs and symptoms. Additionally, this system would enable bidirectional communication to LHDs and healthcare facilities, ultimately improving care and health outcomes. Resources include:

- APHL Overdose Biosurveillance Resources and Community of Practice
- APHL Model Opioids Biosurveillance Strategy for Public Health Practice
- APHL Expanded Biosurveillance Strategy for Public Health Practice
- Insights from biosurveillance: non-fatal opioid overdoses in Rhode Island
- Biosurveillance of Drug Overdoses and Substance Misuse in Minnesota

2. Identify priority areas for targeted biosurveillance

Given Maryland's objective to respond to a changing drug supply and the reality of resource constraints, targeted biosurveillance implementation may be most effective. Prioritization of high-risk areas or underserved populations using existing data sources, including ESSENCE, ODMAP, CDC WONDER, RAD data, EMS, poison control, and SUDORS data may be necessary. Triangulation of these data sources with other real-time drug trend intelligence may provide additional insight into exposure risks and emerging substances, including:

- National Drug Early Warning System (NDEWS) – national drug trends
- Center for Forensic Science Research and Education (CFSRE) – national trend reports on novel psychoactive substances (NPS)
- U.S. Drug Enforcement Administration's National Forensic Laboratory Information System – data and trend information on controlled and noncontrolled substances identified through law enforcement drug seizures nationwide
- National Poison Data System Surveillance System – national insights to poison exposure management, including illegal substances and commercial products

3. Identify laboratory partner(s)

Given that the MDH Laboratories Administration does not currently have capacity to conduct overdose biosurveillance, partnership with a laboratory capable of definitive diagnostic testing (e.g., LC-MS/MS for a standardized drug panel) may be necessary. Assessment of the laboratory's relationships with hospitals, and its capacity to routinely receive specimens would be important considerations.

Potential partners MDH has previously worked with include NMS Labs, Axis Forensic Toxicology, Path Group and Viracor-IBT.

4. Determine the analyte panel

Clear communication of the intended analyte panel to a partner laboratory, along with establishment of timelines and validation capacity for all analytes, would be important for implementation. Given the rapidly evolving drug supply, analyte panels may require periodic updates, and validation plans that allow for timely incorporation of new substances should be considered.

An overdose biosurveillance analyte panel would ideally include a broad range of substances, including common over-the-counter, prescription/therapeutic and illicit drugs**. The APHL section *Analytic Considerations in Non-fatal Overdose Biosurveillance Programs* within the Expanded Polysubstance Overdose Biosurveillance Strategy** provides recommended guidance for panel development**.** The system would also benefit from remaining informed by complementary data sources that offer timely drug trend intelligence (see Recommendation 3 above).

5. Identify hospital partners

Identification and selection of hospital partners capable of packaging and sending residual or remnant biological specimens from ED patients presenting with suspected non-fatal overdose to the partnering laboratory in a timely manner would be an important next step. Specimen handling should align with existing workflows to preserve drug concentrations. Hospital partners would need to provide required data elements and discussions regarding shipping materials, courier services, and potential reimbursement may be necessary.

Establishing a minimum weekly coverage target for specimens from unique overdose events per hospital may support consistent surveillance, with assessment of each hospital's capacity to meet that target. In Cecil County, key informants estimated weekly sample volumes of 20-30 and reported that remnant specimen processing could be integrated into current workflows without additional staffing.

Communication tools, such as the **APHL biosurveillance factsheet template**, may help build awareness and buy-in among hospital staff. To minimize burden, early engagement of key hospital personnel—including providers, laboratory staff, privacy officer, IRB director, hospital administrator, Chief Medical Officer (CMO) and other systems level administrators—was recommended.

6. Communicate required data elements

Confirmation is needed that participating hospitals can meet data preparation and submission requirements, including specimen ID, patient ID, specimen collection date, test date, test(s) performed, results and limited patient data (e.g., age, sex, race, ethnicity, patient residence location, and clinical presentation information, if available). APHL also recommends capturing additional laboratory details, such as specimen type (e.g., whole blood, serum, urine), test method, analytical platform and detection and reporting limit for quantitative assays. Inclusion of appropriate metadata is also necessary to support accurate interpretation and aggregation of results.

Address any confidentiality concerns and refer to the *Interpretation, Management, and Dissemination of Data* section in the Expanded Polysubstance Overdose Biosurveillance for detailed guidance on all required data elements.

7. Establish clear processes for specimen and data transfer, and data integration and dissemination

Coordination between laboratory and hospital staff would be important to develop and establish clear specimen and data transfer procedures. Considerations of how individual or aggregate results are shared with participating hospitals may also support transparency and engagement. Timely, aggregate reporting of definitive toxicology findings to hospitals and LHDs could enhance understanding of local drug trends and help demonstrate the value of participation.

Designated points of contact for drug-related data sources (e.g., forensic testing, MPC, OCME, RAD, ESSENCE, etc.) may facilitate formal linkages and bidirectional data sharing. Standardized communication protocols, clearly defined roles, and recurring meetings could improve timeliness, and reduce fragmentation. Integrating fatal, seizure, and drug-checking data with non-fatal toxicology results may strengthen analyte panels, enhance situational awareness, detect emerging adulterants such as medetomidine, and inform timely public health and community alerts. Resources include:

- ChangeLab: Leveraging Data Sharing for Overdose Prevention - an overview of relevant legal, health, and equity considerations in collecting, using, and sharing overdose-related data
- Basic Drug Use Epidemiology Guide – Resource to strengthen public health capacity for surveillance and epidemiology to inform local prevention and response efforts
- CSTE Overdose Surveillance Capacity Building – Resources for strengthening surveillance infrastructure, data quality and analytic capacity

LIMITATIONS

Surveillance perceptions were informed by a limited number of key informants, and not all partners involved in drug testing or surveillance may have been captured. Although efforts were made to identify relevant systems and data sources, other surveillance streams or data inputs may exist that were not included in this rapid assessment.

Objective 3 and 4: Medetomidine-related interviews with people at risk of overdose and clinical partners - Cecil County

Objective 3. Conduct interviews with people at risk of overdose (PARO) and use findings to develop community and first responder guidance for cases involving medetomidine and sedative adulterants.

Objective 4. Conduct interviews with clinical response partners in a variety of settings, including hospitals, primary care and specialty behavioral health, and utilize findings to develop guidance for clinical partners.

BACKGROUND

For these two objectives, we conducted medetomidine-related key informant interviews (KII) and in-depth semi-structured interviews to understand factors contributing to overdoses in Cecil County, identify barriers and facilitators to service access, assess strengths and gaps in the current service landscape, and explore experiences in managing or receiving treatment for medetomidine withdrawal. Interviews were selected because they are best suited for data collections like this one where greater confidentiality, flexibility, and depth are needed. We synthesized the qualitative data for Objectives 3 and 4 together to provide a more holistic picture of medetomidine-related use and withdrawal presentations.

In this section, we use the following vocabulary:

- **Provider** – any person providing clinical or other services to PARO
- **Outpatient treatment** – substance use disorder (SUD) services that provide lower-intensity monitoring and allows individuals to live at home without requiring overnight or long-term admission to a facility .
- **Inpatient treatment** – SUD services involving intensive medical or psychological monitoring in a 24-hour setting.
- **Intensive Outpatient Program (IOP)** – programs consisting of at least nine hours and no more than 20 hours per week of SUD treatment. Programs typically offer medical services by phone within 24 hours or in-person within 72 hours.
- **Residential program** – programs that provide SUD treatment while living on-site in a residential setting. These programs can vary in intensity, from a few hours a week of treatment focusing on life skills development to clinical management that provides 24-hour oversight.
- **Medications for Opioid Use Disorder (MOUD)** – medications such as methadone or buprenorphine that ease opioid withdrawal symptoms, reduce cravings, and treat opioid use disorder.
- **Detoxification** – specialized treatment facilities that provide monitoring, medication management, and supportive care to help individuals safely withdraw from drugs or alcohol.

DATA SOURCES AND METHODS

Prior to arriving in Maryland, we worked with MDH to identify key informants who could give insights into the increase in withdrawal symptoms related to medetomidine. We completed a total of 16 KIIs from a range of sectors, including non-profit, local and state government, hospital, law enforcement, and emergency services. Each KII lasted approximately 30 minutes and was not recorded; extensive notes were taken instead (**Appendix C**). These KIIs allowed the team to better understand the situation on the ground from a local and state perspective. An interview protocol (**Appendix D**) and guides for service providers and PARO were developed based on KII findings and in consultation with subject matter experts, MDH and CCHD.

We conducted 29 in-depth semi-structured interviews with 34 service providers in Cecil County. One interview was conducted in Baltimore City with five providers who had treated several patients with

suspected medetomidine exposure. Interviewees represented a broad range of service providers, including hospital, community-based, and correctional facilities. We also conducted one facilitated group discussion with approximately 30 members of the multi-sector Cecil County response team, which had mobilized in March and April 2025 and continued to meet to address challenges related to medetomidine (**Appendix E**). Data from this facilitated discussion were not included in this analysis because the format and questions differed from the semi-structured interviews; findings are presented separately (**Appendix F**) to provide additional contextual insight.

In Cecil County, a total of eight in-depth semi-structured interviews with PARO and four street intercept interviews were completed, all related to medetomidine. Street intercepts are a rapid method for collecting data at the point of recruitment by approaching individuals in public settings to administer brief questionnaires. The street intercept interviews were conducted in an area with known high rates of substance use (**Appendix G**). Data from street intercept interviews were not included in this analysis; findings are presented separately (**Appendix H**). For interviews with PARO, participants were screened for eligibility, which included (**Appendix I**):

- At least 18 years of age
- Self-reported use of illicit opioids on or after March 1, 2025
- Ability to complete the interview in English
- Current resident of Cecil County, Maryland or individual with connections to Cecil County including receiving substance use-related services in the area
- Ability to provide informed consent

All participants provided verbal informed consent, including permission to audio record and transcribe the interview. Interviews with service providers lasted approximately 30-60 minutes. Interviews with PARO lasted approximately 30-45 minutes, and participants were remunerated with lunch.

- The interview guide for service providers included questions about factors contributing to opioid-related overdoses in Maryland, services available to PARO in the community, barriers and facilitators to accessing these services, and recent experiences responding to acute opioid overdoses and managing withdrawal (**Appendix J**).
- The interview guide for PARO included questions about their experiences with substance use and overdoses, observations about drug use, SUD services, barriers and facilitators to accessing these services, medetomidine knowledge, changes in drug use, and presentation of withdrawal symptoms (**Appendix K**).

Detailed notes were taken during each interview that closely approximate interviewees' responses; any quotations in the results reflect the exact words used by interviewees. After each interview, the interviewer and notetaker debriefed to document and discuss key findings. We employed rapid qualitative analysis to ensure timely recommendations. At the end of each day, the team conducted daily debriefs to reflect on key findings and emerging themes from all interviews from the day. Interview questions were used as the initial coding framework with notes from each individual interview first organized by question in Microsoft Excel. The notes pertaining to each question were then organized into broader analytic domains and summary sheets were developed for each of those domains. Responses were compared across participants for each domain to identify patterns, variations and cross-cutting themes among participants. Combined results for interviews conducted in both Cecil County and Baltimore are presented below.

RESULTS

Service providers included:

- 11 hospital providers, including medical doctors and nurses
- 6 peer recovery specialists (PRS)

- 4 outpatient MOUD providers
- 4 first responders
- 3 correctional facility providers
- 8 residential treatment/detoxification facility representatives
- 2 primary care providers
- 1 outpatient behavioral health provider

All PARO participants identified as White. The median participant age was 40 years and 75% were insured through Medicaid. Most participants had been using drugs for 10 or more years [range (4-29 years)].

- 2 participants reported active use of drugs and 1 had no knowledge of medetomidine
- 2 participants reported active use of drugs assumed to contain medetomidine
- 2 participants experienced a short relapse during which they used drugs assumed to contain medetomidine, and their withdrawal was managed in a detoxification facility
- 2 participants entered treatment after extended use of drugs assumed to contain medetomidine and required inpatient care to manage their withdrawal symptoms

Analysis of interview data yielded 8 key finding areas: current overdose trends in Cecil County and Maryland; existing services; service access barriers and facilitators; medetomidine knowledge, exposure and sources of information; medetomidine-related overdose; medetomidine-related withdrawal; medetomidine-related needs; and PARO substance use history. These findings provide local context and understanding of the issue, as well as identify existing opportunities and gaps.

1. Overdose Trends and Factors Contributing to Overdoses

Interviewees noted several observed trends in overdose:

Most providers and PARO described an apparent reduction in overdose deaths alongside increases in overall overdoses and reports of life-threatening withdrawal symptoms. PARO described losing friends, family and people "just disappearing". PARO also described more severe withdrawal symptoms than previously, including seizures/shakes, "brain zaps", increased blood pressure, and episodes of passing out with use. PRS noted that many overdoses involved the same individuals, with fatalities more common among people who used drugs long-term and those not engaged in community-based overdose prevention services. Notably, two providers reported more overdoses occurring among patients on MOUDs over the past 12–18 months.

Interviewees identified several factors contributing to overdoses:

- **Drug use pattens.** Providers described generational exposures to substance use and easy drug access, which together sustained and normalized use among many of their patients. PARO described shifts from injecting to snorting to avoid xylazine-related wounds and collapsed veins. Many providers also observed this shift, especially among older, more experienced PARO, to reduce both medetomidine- and xylazine-related health risks. PRS observed that PARO often sought more potent supplies to reduce costs by using less to gain the same effects, alongside widespread polysubstance use, such as combining crack with methamphetamine. Despite the dominance of fentanyl, they are also seeing a demand for "straight heroin," and providers noted more cases of alcohol withdrawal. A community provider described a substitution pattern in which stabilizing opioid use coincides with increased stimulant consumption, with methamphetamine perceived by some as a "safer" alternative; PRS corroborated this trend of concurrent opioid and stimulant use, which complicates treatment planning and engagement. One PARO also suggested that the accessibility of naloxone may unintentionally encourage risk-taking, as people feel less afraid of overdosing.
- **Geographical context**. All providers identified Cecil County as a high-traffic area with multiple routes for drug entry and exit within Maryland (e.g. Chesapeake Bay and Baltimore) and out of state

(e.g., Pennsylvania and Delaware). PRS reported that most of the local drug supply comes from Philadelphia, Pennsylvania and Wilmington, Delaware; few travel to Baltimore for supply.

- **Local hotspots.** Providers noted that certain areas, particularly those with less access to education, economic opportunities and communities experiencing housing insecurity, are at higher risk for drug use and overdoses and are often concentrated at specific sites. These include Motel 6, Sunrise, Elkton-Hollingsworth Manor, side streets off Mainstreet, a trailer park in northeast, and behind the Wal-Mart shopping center.
- **Drug supply changes**. Providers noted that despite fentanyl remaining prevalent, the drug supply is increasingly cut with new and emerging substances, heightening overall volatility, potency and health complications. PARO confirmed this observation. For example, both providers and PARO talked about the notable shift from xylazine to medetomidine and perceived xylazine as easier to manage or less commonly associated with complications.
- **Clinical response changes.** Providers noted that naloxone response appears to have changed, with more cases requiring multiple doses. Although people may resume breathing after a single dose, they remain unconscious or unresponsive.

2. Services Offered

Hospital services include medical stabilization, MOUD inductions, and take-home naloxone with overdose education.

Medical stabilization included clinical monitoring and medications not available elsewhere (e.g., patient-controlled analgesia (PCA) hydromorphone) to manage acute withdrawal. MOUD inductions in the ED included microdosed buprenorphine when acute withdrawal was controlled and the individual could consent, as well as methadone starts or restarts. There were observations that some emergency providers expressed hesitancy initiating MOUD due to concerns about limited follow-up care and the absence of onsite addiction medicine; although, addiction medicine support was available for consultation. Overdose education covered naloxone distribution and use and medetomidine informational flyers. Behavioral health services were also available with limited hours. PRS linked patients to substance use treatment services, while social workers connected patients to broader behavioral health services.

Outside the hospital, Cecil County offers a mix of MOUD and IOP programs, strong community-based overdose prevention services led by PRS, and active first responder engagement, though integration between behavioral health and SUD treatment was rarely discussed.

- Buprenorphine and methadone are both available, but methadone is more popular in Cecil County. Some outpatient MOUD providers also offered wound care.
- Overdose prevention and response commonly included naloxone distribution, education, rescue breathing training, and mask distribution; some sites provided fentanyl and medetomidine test strips, while others identified this as a gap. Interviewees also noted another gap that medetomidine was not consistently discussed.
- Primary care providers (PCPs) can offer MOUD and coordinate other healthcare needs for stable patients, but PCPs generally did not provide MOUD inductions.
- Multiple American Society for Addiction Medicine (ASAM) 3.1 and 3.3 programs are available locally, while 3.5 and higher require travel to other counties.[9] One recovery/housing facility in Cecil offered comprehensive family and women's services with childcare, though more supports like these are needed. Some services are available to people without insurance.
- One correctional facility in the area provides MOUD, including both detoxification and maintenance to individuals during incarceration. They can prescribe buprenorphine but not methadone; methadone can be administered in collaboration with a local OTP. The facility also offers medical and mental health services.

[9] ASAM Criteria Levels of Care: https://americanaddictioncenters.org/rehab-guide/asam-criteria-levels-of-care

- **First responders provide overdose response and some linkages to care.**
    - Law enforcement officers who encounter PARO during patrols or calls for service may connect them to overdose prevention or clinical services. They also perform laboratory testing on drug paraphernalia when linked to criminal activity and aid in syringe or drug waste disposal with the local community-based overdose prevention organizations. Law enforcement also conducts overdose tracking and files a report for each event they are involved in.
    - EMS responds to overdoses, stabilizes patients and transports them to the hospital as needed. There is an EMS buprenorphine induction protocol, but most patients are ineligible due to sedation, possibly due to sedative adulterants. EMS also oversees the Prevention Overdose Response Team (PORT) and Mobile Integrated Health Team. PORT offers counseling and linkages to treatment to individuals who have recently overdosed and their families, though awareness of PORT is limited outside the health department and EMS.
- **Community-based overdose prevention services are anchored by two major organizations**: Harmony at the health department and Voices of Hope. They offer deliveries, wound care supplies and services, opioid associated disease prevention supplies and participation cards, counseling, drug paraphernalia testing through RAD, linkages to care, initial transport to SUD treatment, and recovery groups. Wound care is often the primary draw. These organizations also run the Cecil Addiction Treatment Coordination Hotline (CATCH), a 24/7 hotline and walk-in service that connects people to wraparound services, such as identification card obtainment, SUD treatment, dental services, nutrition programs with crisis response; and Sustaining Peers in the Emergency Department (S-PED), a hospital-based program with onsite PRS who support patients hospitalized for substance use–related issues and link them to care.

PARO reported awareness of community-based overdose prevention and residential/detoxification services but did not explicitly mention outpatient MOUD or related supports.

Community-based overdose prevention programs were described as well-known and trusted, providing connections to treatment, clothing, and safe supplies. PARO attributed this trust to their roles as primary local providers and strong outreach staffed by PRS, particularly by the community organization. They also identified multiple recovery houses, including Voices of Hope, Haven, Brantwood, Charlotte, and Dexter.

3. Service Access Barriers and Facilitators

Interviewees identified five barriers to SUD treatment and overdose prevention services.

- **Medetomidine in the drug supply**. Medetomidine withdrawal was reported to be severe, oftentimes requiring care in an ED or ICU before an individual could begin SUD treatment if indicated. PRS and hospital staff reported that many treatment facilities are not equipped to manage medetomidine withdrawal effectively; residential programs and detoxification programs were reported to be especially ill-equipped. They noted that patients who may otherwise be motivated to start treatment are delaying or avoiding it if they suspect that their symptoms will not be effectively managed or if they wish to avoid hospitalization altogether. They also reported that many patients who experience severe medetomidine withdrawal or whose symptoms are poorly managed at a hospital or treatment facility are self-discharging early or showing lower treatment motivation. In some cases, fear of medetomidine in the drug supply left patients more inclined to discuss treatment options.
- **Lack of SUD treatment availability or knowledge of programs**. Even in the absence of medetomidine in the drug supply, SUD treatment services were reported to be costly, sometimes more costly than illegal drug use, and limited in terms of modality and medications offered. Reported gaps include outpatient programs, detoxification programs, intensive inpatient programs, residential programs, programs that provide MOUD, especially methadone, programs within county

lines, low-barrier programs (i.e., programs with flexible hours and scheduling and fewer requirements), programs that accept Medicare and Medicaid, programs that accommodate parents, programs with dedicated addiction, behavioral health, and peer support specialists, and programs that provide both SUD treatment and medical care. The smaller programs that do exist often lack capacity to apply for grants to expand their services. Existing outpatient programs are also not well known to the community, especially PARO who are experiencing unstable housing or without phone access.

- **Restrictive or unhelpful SUD treatment policies or procedures**. According to providers, when patients seek SUD treatment, they can be turned away if they are unstable; if they present with complex medical needs, unmanaged acute psychiatric symptoms, infected wounds or endocarditis requiring IV antibiotics or other conditions indicating a higher level of care; or if their blood pressure, heart rate, or withdrawal score are not within range. Pregnant and parenting women (PPW) face additional barriers, including a state-required referral process that can delay placement in higher-intensity residential programs with childcare and family-centered services by one to two weeks. There are also limited PPW facilities in the state, and placements are often based on availability, rather than convenience. Long wait times, fear of acquiring an infection while waiting, and physical discomfort were also reported to deter PARO from seeking treatment at hospitals.
- **Lack of wraparound services**. Critical support services like transportation, housing, childcare, pet care, and primary care were reported to be limited or entirely absent. Most SUD treatment facilities, for example, use Uber to transport patients, yet this service does not consistently service Elkton. While Medicaid provides transportation assistance to the nearest treatment programs for its patients, these programs are not necessarily ideally suited for all patients.
- **Fear and other life stressors**. Providers and PARO reported that PARO may not access overdose prevention and SUD treatment services if they fear arrest, judgement, discrimination, or coercion into SUD treatment; if they are navigating other competing life stressors like grief, loss, housing stress, financial stress, unemployment, isolation, or complex medical needs; if they are experiencing decreased motivation or readiness to engage; if their support systems are not entirely supportive of change; or if they lack insurance, an address, or phone access. Being without a phone makes it difficult to stay informed about current SUD treatment options and follow through with treatment referrals. Additionally, women with children may face heightened negative attitudes, judgement and societal pressure, leading some to downplay the severity of their substance use.

The most commonly reported facilitators to services include:

- Financial assistance, sliding scale fees, and flexible payment options for SUD treatment
- On-demand services that enable early engagement and timely treatment initiation
- Availability of MOUD at hospitals and other places accessible to individuals without transportation
- Extended hospital stays to address weekend service gaps
- Effective medetomidine withdrawal management to improve alertness, cognition, and willingness to engage in SUD treatment
- Telehealth options
- Warm handoffs to services before hospital discharge
- Follow-up appointments at convenient locations
- Wraparound services to assist with transportation, housing, childcare, food, employment, phone access, and medication costs
- PRS and social workers to support care coordination and build trust
- Peer-to-peer sharing of information about available services
- Non-judgmental care from providers that meets individuals where they are in their recovery and avoids coercive treatment approaches

4. Medetomidine Knowledge, Exposure and Sources of Information

Across settings, interviewees were knowledgeable about or directly impacted by the introduction of medetomidine in the drug supply:

- Nearly all the PARO interviewed were familiar with medetomidine, its indications, or its effects, and many are fearful of it and actively trying to avoid it. Only one PARO had never heard of medetomidine, whereas another had heard of it but did not think it was in the local drug supply.
- All providers were aware of medetomidine; however, depth of knowledge and direct experience varied by setting, which may influence preparedness and response capacity. Hospital-based providers, particularly in the ED, reported direct experience managing medetomidine-suspected overdoses and withdrawal, while ICU providers primarily encountered withdrawal-related complications. EMS and law enforcement were more familiar with medetomidine-suspected overdoses in the field. In contrast, many community-based providers described more indirect exposure, relying on patient reports or communication with other providers.
- Hospital staff reported seeing patients with medetomidine-related overdose or withdrawal daily, with the hospital treating up to 22 patients a day.
- A first responder reported seeing patients with suspected medetomidine exposure on a weekly basis and that overdose reversals were also more difficult when medetomidine was involved.
- Most providers did not report demographic differences among these patients; however, one provider noted that they seemed to be young and typically healthy with no co-occurring issues, whereas another observed that most patients were from Cecil County.

Without toxicology testing, medetomidine exposure was largely inferred by PARO and providers:

- PARO reported recognizing that they were using substances adulterated with medetomidine because they experienced extreme effects, describing feeling “completely knocked out” or “comatose.” These sensations were much more intense than their usual experiences of “numbness” or a “sense of relief.” Although medetomidine drug test strips were available, PARO did not specifically reference their use or discuss them.
- In the absence of confirmatory toxicology testing, providers reported suspecting medetomidine exposure based on clinical presentations, severity of withdrawal symptoms, and medetomidine’s documented detection in the local drug supply. Providers noted a decrease in xylazine-related wounds alongside increased reports of atypical symptoms attributed to medetomidine, including memory loss, sedation, and severe withdrawal.

Interviewees reported receiving information about overdose trends, changes in the drug supply and medetomidine from multiple sources of information:

- PARO received their information from the news, social media or other online sources, Voices of Hope, RAD board, other PARO, and dealers.
- PRS learned from online sources, especially from Philadelphia, police scanners, RAD reports, and their clients.
- Hospital staff and other providers learned from bulletins from nearby jurisdictions (e.g., Philadelphia, Delaware), law enforcement, PRS, colleagues, professional training, publications or other online sources, Voices of Hope, RAD board, and the Cecil County Overdose Fatality Review Team.

5. Medetomidine-related Overdose: Symptoms, Management, and Prevention

Across settings, interviewees reported that medetomidine-suspected overdoses generally resembled typical opioid overdose but with several distinguishing features:

PARO perspective

Seven of eight PARO reported exposure to drugs they believed contained medetomidine. All the PARO interviewed had firsthand experience with overdose, with half having experienced an overdose within the past six months. Others had either witnessed an overdose or knew someone who had overdosed within the past six months. Although none could confirm that these incidents involved medetomidine, those who witnessed an overdose described symptoms consistent with typical opioid overdose (e.g., blue lips, gray skin, gurgling, non-responsiveness). They also observed that overdose symptoms appeared to occur more rapidly, within 3–5 minutes of use, and were associated with longer sedation.

Provider perspective

Providers reported that patients with suspected medetomidine overdose have typical overdose symptoms with some differences. Medetomidine-suspected overdoses were characterized by sinus bradycardia frequently with borderline cardiac arrest, significant sedation, and altered mental status. The most frequent observation about medetomidine-suspected overdose among PARO and some providers was that although naloxone generally restored breathing, it was either less effective or ineffective against sedation. This finding is consistent with the expected effects of naloxone on medetomidine-related overdose symptoms. In many cases, bystanders who administered naloxone in cases of potential medetomidine-related overdose gave anywhere from three to ten naloxone doses. In those overdoses, providers reported that patients exhibited altered mental status but did not show signs of respiratory depression or hypoxia after administering naloxone. Memory loss also emerged as a concern, particularly among individuals who experienced prolonged periods of unresponsiveness.

Care and management of medetomidine-suspected overdoses remained largely supportive and symptom-driven, with naloxone as a first-line intervention; however, response to naloxone appears to differ from that of opioid-involved overdoses without medetomidine.

PARO perspective

PARO demonstrated an ability to recognize the signs of overdose and respond effectively using a sternum rub and naloxone. Some reported, however, that more naloxone, upwards of ten doses, appeared to be needed to reverse overdoses they had witnessed or heard about within the past six months. There's some belief among PARO that individuals can develop tolerance to naloxone. If an individual revives with naloxone, no further follow-up is done. One interviewee reported hesitancy in giving naloxone due to the risk of immediate opioid-related withdrawal, whereas two interviewees reported a reluctance to call EMS.

Provider perspective

Law enforcement officers are often the first on scene during an overdose response, conducting rapid assessments, administering naloxone and requesting paramedic or emergency medical technician (EMT) support. Individuals who regain responsiveness frequently refuse further medical care, sometimes due to fear or concern about legal consequences. EMTs will administer additional naloxone to ensure adequate dosing and provide basic life support; however, airway management requires advanced EMS support. When patients are unresponsive and signs of circulation or breathing cannot be verified, calls are upgraded to cardiac arrest and advanced cardiac life support units are dispatched. In such cases, adulterants are often presumed to be contributing factors. EMS reported increases in upgraded cardiac arrests and hospital transports, estimating that about 60% of overdose responses now result in transport to the hospital, compared with far fewer transports previously, placing additional strain on EMS resources.

EDs focused on monitoring, management and stabilization of acute symptoms. Recovery following medetomidine-suspected overdoses was also notably longer and slower, requiring extended observation

and increased monitoring. Once sedation resolved, patients frequently experienced medetomidine-suspected withdrawal symptoms, which contributed to distress, agitation, and sometimes early departure from care settings. In the ED, patients who regained consciousness often expressed a strong desire to leave prior to completion of recommended observation, only to return when symptoms recurred, worsened or became unmanageable.

While providers have not observed a clear increase in the number of medetomidine-related overdoses and fatalities, there was concern about an increase in associated medical complications, reinforcing the need for caution and extended monitoring. Given the evolving nature of medetomidine involvement, providers emphasized heightened clinical awareness and a lower threshold for referral to emergency services or hospitalization.

Outpatient providers reported limited direct experience with medetomidine-suspected overdoses but noted growing awareness overdoses are more complex to manage, and withdrawal symptoms make cessation difficult. They also reported that patients may be less responsive to naloxone; however, it was unclear whether this reflected restoration of breathing without return of consciousness or lack of response altogether, highlighting an important need for clearer education on naloxone response expectations.

Since the emergence of medetomidine, overdose prevention efforts continue to rely on established community-based resources and opioid-focused interventions.

- First responders continue to engage patients who are responsive and willing to receive information, providing educational materials or connecting them directly to local community-based overdose prevention organizations. They also notify hospitals to facilitate referrals to S-PED and PORT to support linkage to care.
- Hospital staff reported ongoing efforts to initiate or restart MOUD in the ED if acute symptoms are stabilized and the patient can consent; however, this has been complicated by the presence of medetomidine and patients require longer hospitalization, more monitoring and more long-term support. Follow-up was also noted to be harder and less consistent. Hospitals continue to provide naloxone and test strips upon discharge and refer patients to PRS for education and linkage to services.
- PRS emphasized the importance of initiating treatment conversations early, including consideration of higher-dose MOUD when clinically appropriate to reduce post-discharge overdose risk. They highlighted the need for robust post-hospital supports, particularly given the increased risks associated with sedative adulterants. PRS also continue conducting outreach and follow-up check-ins and provide education to patients and families on safer use practices, the Good Samaritan law, rescue breathing, and CPR.
- Community-based providers reported maintaining core overdose prevention strategies, including encouraging individuals not to use alone, avoiding abrupt cessation when possible, utilizing healthcare services (including 911 and the ED), and providing access to naloxone and test strips. While some programs have begun incorporating medetomidine-specific information, most described the situation as evolving, with providers continuing to learn and adapt strategies in response to emerging trends.

6. Medetomidine-related Withdrawal: Symptoms, Treatment and Challenges

Withdrawal symptoms

Suspected medetomidine withdrawal was consistently described as more severe, rapidly progressing and protracted than typical opioid or xylazine-related withdrawal, with persons appearing sedated one moment and experiencing withdrawal the next. Symptoms often worsened over time rather than improving within 24 hours and were perceived as potentially fatal. No notable distinctions or demographic differences were identified between clients with suspected medetomidine withdrawal and those believed not to have medetomidine withdrawal.

PARO perspective

Most PARO stated that the type of symptoms they experienced did not differ too much from typical withdrawal symptoms but emphasized their increased severity. PARO reported feeling like their heart was racing, hot and cold sweats alongside nausea, vomiting, dry heaving, perceived paralysis (loss of control of lower extremities), shaking or convulsions, "brain zaps" and memory loss. They also described feeling "dope sick", which in some cases felt "ten times worse than heroin withdrawal" and left people feeling suicidal. PARO also described a distinct pattern of use and withdrawal, characterized by rapid withdrawal onset, cycling between sedation and acute illness, and a shorter interval between use (1–2 hours compared with 6–8 hours with fentanyl and xylazine).

Provider perspective

Observed symptoms of suspected medetomidine withdrawal were consistent with reported PARO experiences. One provider described the presentation as consistent with typical opioid withdrawal, but "dialed up to 11," reflecting the perceived severity of symptoms. Hospital providers noted hypertension and tachycardia, vomiting, diaphoresis, catatonia, tremors or seizures, anxiety, agitation or delirium, and severe pain. Some also noted leukocytosis and prolonged QT interval. Clinical Opiate Withdrawal Scale (COWS) scores were frequently reported in the high 20s, exceeding those typically observed with fentanyl withdrawal. Vesicular lesions were noted, although providers emphasized that xylazine-like wounds were not observed. The need for more frequent use to alleviate symptoms was described as limiting individuals' ability to maintain employment or engage in daily responsibilities, suggested broader implications for economic stability, productivity and recovery trajectories.

Outpatient providers and PRS described additional symptoms reported by PARO, including chest pain, weakness, temporary vision or hearing loss, emotional lability, psychosis or hallucinations, dissociation, diarrhea, and cardiac complications, such as suspected heart attacks and strokes.

Treatment and clinical management

- In the absence of confirmatory testing or standardized protocols, providers relied on clinical presentation to infer exposure and manage symptoms empirically. Medetomidine-suspected withdrawal most often required ED or ICU-level care, as outpatient management and self-directed strategies were largely insufficient.
- PARO reported attempts at self-management (e.g., benzodiazepines, clonidine, gabapentin, acetaminophen, ondansetron, tapering, or abrupt cessation) rarely succeeded beyond 12 hours before symptoms necessitated emergency care, hospitalization or continued drug use.
- Hospital management typically began in the ED and required high medication doses, continuous monitoring, and escalation to ICU-only therapies. Symptom-driven Opioid Withdrawal Order Set guided by COWS scores standardized care but inferred medetomidine exposure**.** Adjunctive meds such as clonidine, gabapentin, tizanidine, benzodiazepines, and IV or PCA hydromorphone were commonly used, escalating to dexmedetomidine for severe cases. ICU transfer and prolonged medication weaning were frequently required, particularly for dexmedetomidine (often 72 hours to 5-7 days); some patients required intubation due to uncontrolled vomiting and aspiration risk.
- Outside hospital settings, adjunctive medications (e.g., clonidine, ondansetron, hydroxyzine, gabapentin) were provided based on criteria including COWS scores and patient presentation.
- Hospital providers reported notable improvements within 24 hours of initiating dexmedetomidine and discussed increasing its use. PARO reported that hydromorphone and clonidine improved comfort but was often insufficient, while tizanidine plus clonidine were described as most helpful by some. PARO did not mention the efficacy of dexmedetomidine specifically. Given the severity, some PARO recommended sedation during detoxification.
- MOUD strategies were challenging for both PARO and providers: methadone was often perceived as ineffective, buprenorphine titration as too slow, and standard opioid withdrawal protocols as insufficient for mixed withdrawal presentations.

System and care delivery challenges

- Hospital teams reported escalating strain with difficult-to-control symptoms leading to prolonged hospitalizations, higher-acuity care, increased cardiac complications, and higher rates of intubation. Reliance on ICU-only therapies strained bed capacity and staffing, while shortages of medications, PCA pumps, and IV access required labor-intensive workarounds. Limited access to addiction specialists contributed to hesitancy around high-dose withdrawal management and concerns that existing opioid withdrawal protocols, particularly hydromorphone, lacked an evidence base and may enable drug-seeking.
- Hospital staff encountered the same patients repeatedly, compounding workload, frustration, compassion fatigue, and burnout. Some providers demonstrated stigmatizing behaviors (e.g., labeling PARO as drug-seeking or framing treatment engagement as primarily as a matter of willingness), even among those intending to adopt more patient-centered approaches. Staff expressed that hearing more patient recovery stories could improve resiliency and reinforce compassionate care, especially with this population and during unfamiliar treatment challenges or patient surges.
- Outpatient, residential, and correctional staff reported limited direct experience managing medetomidine-suspected cases. They expressed apprehension about admitting or treating these cases due to gaps in protocols, medications, monitoring, and trained staff, prompting increased transfers to EDs for both clinical and precautionary reasons. Providers were more hesitant to initiate MOUD because of symptom severity and discomfort with using higher-than-usual doses of opioids and adjunctive medications.
- PRS described the ED as the de facto detoxification setting, despite not being designated, because it was viewed as the only environment equipped to manage complex withdrawals. Patients referred to detoxification or residential programs that could not manage severe symptoms often required subsequent ED admissions. Many patients asked about medetomidine-specific protocols before entering treatment; absent or undisclosed protocols fueled hesitancy, and this information-seeking was sometimes misinterpreted as drug-seeking.
- PARO reported that although they did not actively seek out medetomidine, it often became the only substance that alleviated their symptoms. PARO reported barriers to care including long wait times, invasive procedures, negative attitudes and beliefs from providers and public, and limited access to medical detoxification, with many perceiving that no facility, including hospitals, could adequately manage severe withdrawal. Collectively, these challenges contributed to early care departure, reluctance to engage in treatment, repeated acute care utilization, and ongoing cycles of withdrawal and return to use.

7. Medetomidine-related Needs

Interviewees identified the following needs to help improve medetomidine-related overdose prevention and the treatment of patients presenting with medetomidine-related overdose or withdrawal:

- PARO identified a need for wider dissemination of medetomidine-related information by trusted sources like Voices of Hope, the health department, and people with lived experience of drug use. None of the PARO identified the CCHD's medetomidine flyer as a source of information.
- PRS identified a need for
    - provider education on effective medetomidine withdrawal protocols
    - community education on medetomidine risks and risk reduction practices
    - supports for PARO starting community SUD treatment following hospital discharge, including a one-stop-shop for stabilization and wraparound services.
- Hospital staff identified a need for
    - onsite addiction care teams

    - improved treatments for medetomidine-related overdose and withdrawal, especially in nonhospital settings
    - improved linkages to outpatient services for patients following hospital discharge
    - better preparedness for managing new and emerging drug threats
    - timelier confirmatory and presumptive testing to inform planning, triage, and treatment options
- Other providers echoed the need for provider education on effective medetomidine withdrawal protocols and added that providers outside Cecil County have minimal awareness of the drug. They also reported a need for:
    - community education on local drug trends and available providers and services
    - protocols for the management of medetomidine-related overdose and withdrawal in community settings
    - greater availability of detoxification facilities, naloxone, 24-hour services, and drug checking in the community and at points of care
    - more support for family and friends of individuals who have overdosed
    - improved coordination, communication, and drug sharing across agencies

8. PARO Substance Use History

Most of the PARO interviewed reported polysubstance use, including opioids (primarily fentanyl), stimulants, benzodiazepines, and cannabis.

- When using opioids, PARO reported typically injecting or inhaling, with half reporting more than one mode of administration. No interviewees reported smoking opioids.
- One interviewee preferred inhaling opioids due to injection-related vein loss, whereas another found that inhaling opioids helped extend a limited drug supply.
- One interviewee reported knowing that their drugs were adulterated but not knowing with what.
- One interviewee was in recovery at the time of the interview.

Most PARO reported some degree of change in their experience of using opioids since the introduction of medetomidine in the drug supply.

- For one interviewee, this change was minimal, limited to slight variations among different bags purchased. For others, the change was more pronounced.
- Many PARO reported a more intense and sedating high compared to previous experiences with opioids. They described feeling "comatose,' "completely out," or "knocked out," with no ability to remember the experience. For one interviewee, this feeling was unlike the "relief" and "escape" they typically expected from opioids.
- PARO also reported a shorter-lasting high that ended within one to five hours, often in rapid onset withdrawal; this was a notable change from fentanyl, which was reported to last six hours, and heroin, which was reported to last ten.
- The short duration of the high changed how some PARO used drugs. They reported using more often or in greater amounts (in one case three times the amount) to achieve the same result or avoid frequent withdrawal. One interviewee reported combining opioids with Xanax to help extend the duration of the high.
- Two interviewees reported significant side effects of opioids since the introduction of medetomidine in the drug supply, including memory loss, head and chest pain, migraines, and a shock-like sensation throughout the body.

All the PARO interviewed described taking steps to reduce their overdose risk. They reported:

- Buying from the same supplier

- Not using drugs alone or using alone and requesting strategically timed check-ins by peers
- Carrying naloxone
- Using community drug-checking services
- Exchanging information with peers about changes in the drug supply and the associated risks

DISCUSSION

Although results reflect qualitative findings from selected interviewees mostly from Cecil County and may not be generalizable to all regions, they highlight both progress and persistent gaps in overdose prevention, as well as emerging challenges associated with medetomidine in the drug supply. Evolving overdose patterns and an increasingly complex, polysubstance landscape alongside resource limitations are placing new demands on service delivery and care across community, healthcare, and public health settings. The emergence of medetomidine-related withdrawal also underscores the limitations of opioid-focused prevention and response frameworks and the need for adaptable, clinically prepared systems. Strengthening overdose surveillance, expanding community-based overdose prevention services, improving linkage to care, and enhancing cross-sector coordination across public health, healthcare, public safety, and community partners can support early detection, response and mitigation. Findings also highlight broader structural issues shaping overdose vulnerability, including housing instability, transportation barriers, and discrimination and negative attitudes and beliefs about PARO among providers that need to be addressed to sustain progress. Continued progress will depend on clear state and local role alignment, investment in workforce resilience, and proactive adaptation to emerging substances.

RECOMMENDATIONS

1. Adapt overdose response and naloxone protocols

Naloxone remains a highly effective intervention for reversing opioid overdoses and may need to continue to be widely distributed and promoted, especially to PARO and their social networks, who are often the first to witness and respond to overdoses. Education should be expanded for providers, first responders, PARO, and families on appropriate dosing, repeat administration, rescue breathing, CPR, the Good Samaritan law, and post-reversal monitoring, particularly in the context of reduced responsiveness and prolonged sedation associated with emerging adulterants, medetomidine in particular.

In the context of medetomidine, guidance and training should emphasize adequate breathing (at least one breath every five seconds or ten breaths per minute) over responsiveness following naloxone administration.[50-52] Clarify that if a person is breathing adequately and their lips or fingertips are not blue, gray, pale or ashen, but they remain sedated or unresponsive, naloxone is likely effective and additional or higher doses are not indicated.[52-55] Overdose response guidance should reinforce calling 911, reassessing signs and symptoms every two minutes, ensuring an open airway, administering rescue breathing if the individual is breathing less than one breath every five seconds, placing the individual in the recovery position and monitoring the individual until care is transferred to EMS or hospital providers when naloxone response is delayed or incomplete.[52,53]

2. Expand overdose and medetomidine-specific education for PARO, families, and communities

MDH, LHDs and partners may consider expanding education on overdose prevention and medetomidine withdrawal. Educational efforts could address strategies to prevent overdoses, recognize and manage medetomidine-related withdrawal symptoms, and identify when higher levels of care may be needed. Messaging may reflect the evolving drug supply and emphasize risk-reduction strategies in the presence of sedative adulterants. Education could also help address fears and misinformation that may lead PARO to delay or avoid hospital-based care for medetomidine-related withdrawal symptoms. Access to supplies,

including medetomidine and fentanyl test strips may also support overdose prevention efforts. In addition to calling 911, the **Maryland Poison Center** may be highlighted as a free, 24/7 resource for PARO, families and communities, offering expert guidance during suspected or unusual overdoses.

A medetomidine palm card like **this one** may help PARO recognize symptoms and seek appropriate care as needed. Trusted sources, such as PRS, OADPOPs, ORPs, and other community-based overdose prevention organizations, may serve as effective channels for information dissemination.

3. Enhance clinical awareness, preparedness and education for emerging drug threats, including medetomidine across all care settings in Maryland

Healthcare systems may benefit from strengthening clinical awareness of emerging substances, including medetomidine, and their implications for overdose prevention and response, withdrawal management, and resource utilization. In the absence of confirmatory toxicology testing or evidence-based treatment protocols, clinical management may rely on patient presentation, prioritizing adequate MOUD for opioid withdrawal, followed by adjunctive symptom management and treatment of sedative or other withdrawal as needed.

Healthcare systems might also proactively assess and adapt clinical workflows, staffing and resources (e.g., beds, equipment, medications) as new symptoms and care needs emerge. Development of no or low-barrier crisis stabilization services, such as a hospital-based behavioral health emergency stabilization unit, may support acute care needs, including complex withdrawal management.[56] Hospitals might consider preparing for rapid escalation in overdose spikes, withdrawal severity and resource demands associated with novel adulterants as part of their emergency surge planning. Resources that can be helpful for overdose response planning include:

- ODMAP's Overdose Spike Response Framework
- NACCHO's Overdose Spike Response Framework for Communities and Local Health Departments
- ASTHO Responding to an Overdose Spike
- CSTE Overdose Anomaly Toolkit

Comprehensive education on medetomidine exposure and withdrawal may be beneficial across care settings in Maryland, including OADPOPs, hospitals, outpatient clinics, residential programs, and detoxification facilities. Educational efforts could address emerging drug trends, including medetomidine, and emphasize trauma-informed, patient-centered care for PARO. Where feasible, care settings may consider developing and clearly communication medetomidine-specific protocols to support transparency, trust, and engagement in care. Education may also increase awareness of available clinical supports, including:

- Maryland Addiction Consultation Service (MACS) – Offers clinical consultation and technical assistance to providers managing SUD.
- Maryland Poison Center – Provides 24/7 expert toxicology consultation for overdose management.
- National Clinician Consultation Center – Offers access to clinical toxicology and substance use consultation services.

See Appendix L on medetomidine-specific guidance and resources for providers.

4. Strengthen continuity of care and communication

Emerging substances are often initially perceived as localized issues and may not be communicated beyond the affected area; however, their impact can extend more broadly. Strengthening statewide communication pathways may support timely dissemination of local drug trend intelligence, particularly from jurisdictions such as Cecil County that may serve as early indicators of broader statewide shifts.

Centralized communication channels could help reach more distal providers and facilitate proactive, coordinated response across jurisdictions.

Improved communication among hospitals, outpatient providers, residential programs, and other community-based services may also support safer transitions of care. Enhanced discharge planning, shared expectations regarding withdrawal management capacity, and clear referral pathways could improve care continuity, reduce premature discharge or readmission, and increase engagement in treatment and prevention services. Resources include:

- Overdose Response and Linkage to Care: A Roadmap for Health Departments
- ASTHO Strengthening Community-Clinical Linkages to Improve Health Outcomes: Convening Summary
- CDC Linking People with Opioid Use Disorder to Medication Treatment

5. Integrate PRS across care settings

PRS might be integrated across emergency, inpatient, outpatient, and community settings as a core component of overdose prevention and response efforts. The lived experience of PRS can provide critical support for PARO and serve as a bridge between patients and providers, potentially enhancing engagement, trust, and linkage to services during high-risk periods, including post-overdose and post-discharge. The model of PRS embedded within the Cecil County hospital (S-PED) represents an example that may inform expansion to other facilities and regions to strengthen overdose response, care transitions, and continuity of care.

6. Continue to support and expand access to care and MOUDs, especially in settings where people's vulnerability to overdose is heightened

Access to timely, coordinated, and person-centered care is essential for individuals at elevated risk of overdose, particularly during high-vulnerability periods such as post-overdose, post-incarceration, hospitalization, or treatment transitions. Expanding low-barrier, integrated service models that reduce barriers and improve coordination is critical. These efforts might include access to housing, transportation, childcare, mental health services, and other social supports that stabilize recovery and reduce overdose risk. Resources include:

- Brandeis Opioid Resource Connector – Program Models
- ChangeLab: Preventing Overdoses and Reducing Drug-Related Harm – A Policy Guide for State and Local Change
- SAMHSA: National Guidelines for a Behavioral Health Coordinated System of Crisis Care
- SAMHSA: Model Definitions for Behavioral Health Emergency, Crisis and Crisis-Related Services
- Evidence-Based Strategies for Preventing Opioid Overdose: What's Working in the United States

Access to MOUD continues to be recognized as a cornerstone of overdose prevention, including availability in jails, prisons, EDs and through low-barrier programs with flexible scheduling and fewer requirements for initiation. Expansion of MOUD access and education for both providers and patients regarding the effectiveness of MOUD in the context of polysubstance use and synthetic opioids remains important. Early initiation and continuity of MOUD alongside wraparound services like housing, transportation, childcare and mental health services, may need to be prioritized across care settings. Resources include:

- Addiction Medicine Toolkit
- CDC Health Care Provider Trainings
- PCSS MOUD Education and Training
- ASAM National Guideline for the Treatment of Opioid Use Disorder

- SAMHSA - Medication-Assisted Treatment (MAT) for Opioid Use Disorder in Jails and Prisons: A Planning and Implementation Toolkit

7. Sustain community-based engagement and clarify roles

Maintaining a consistent, trust-centered presence in communities may strengthen overdose prevention and response beyond crisis periods. Ongoing outreach—including overdose education, naloxone distribution, and engagement with PARO—can function as routine practice rather than being limited to overdose spike events. Community-based organizations are often well positioned to lead outreach given established trust and credibility, while state and local oversight agencies provide coordination, resources, and technical expertise.

Clarifying and aligning state and local governmental and public health roles may strengthen coordination and enhance overdose prevention and response efforts. MDH might lead statewide overdose surveillance, cross-jurisdictional communication, data governance, technical assistance, and interagency coordination, while LHDs implement community-level prevention and response through local partnerships using state-supported guidance and resources. Cecil County's multisector model—triangulating local and regional data and coordinating across health departments, hospital, community organizations, law enforcement, EMS and PRS—illustrates how aligned state and local roles can facilitate rapid adaptation to emerging drug trends and strengthen overdose response. Resources include:

- Maryland Commission on Public Health - Building the Future of Maryland Public Health 2025 Final Report
- National League of Cities - Aligning City, County and State Resources to Address the Opioid Epidemic: Lessons Learned and Future Opportunities
- NACCHO – Stakeholders and Partnerships, Opioid Overdose Epidemic Toolkit for Local Health Departments
- National Association of Counties: Promoting Health and Safety Through a Behavioral Health Continuum of Care
- Public Health and Safety (PHAST) Toolkit: Guidance for Data-driven Overdose Response Coordination Among Public Health, Criminal Justice, Law Enforcement and First Responders

8. Strengthen overdose surveillance and practice-based learning

Ongoing overdose surveillance and data sharing are essential to detect emerging substances, monitor trends, and inform rapid response. Incorporating overdose biosurveillance can further support providers particularly when new or atypical symptoms emerge alongside increases in nonfatal overdoses (**See Objective 2**). Health systems and public health might promote practice-based learning by integrating frontline provider and community insights, sharing emerging findings, and adapting guidance as evidence evolves. Consider launching a **Photovoice**, or similar initiative, to elevate lived experience, share success stories, and inform prevention and response efforts.

9. Support workforce resilience and reduce burnout

Healthcare and public health leaders might recognize the emotional and operational strain associated with managing increasingly complex overdose and withdrawal presentations. Strengthen workforce resilience by sharing success stories, encouraging peer support among staff, expanding access to PRS, and investing in training and support to reduce burnout. Continue efforts to reduce negative attitudes, beliefs and judgement towards PARO through trauma-informed, patient-centered training for healthcare providers and partners. Training and education opportunities might be hosted in partnership with community-based organizations actively engaged in overdose prevention and grounded in lived/living experience. Training might acknowledge the challenges faced by providers while promoting non-stigmatizing, person-first

language, framing SUD as a treatable medical condition with recovery possible, highlighting the societal and structural drivers of SUD, and reinforcing understanding of the role and effectiveness of MOUD. Resources include:

- PCSS MOUD - SUD 101 Core Curriculum
- HealtheKnowledge – SUD Basics Trainings
- NIDA - Words Matter: Preferred Language for Talking About Addiction
- Shatterproof Addiction Language Guide
- Trauma-informed Recovery-oriented Systems of Care Toolkit

LIMITATIONS

This section is subject to several limitations. Individuals who are disengaged from services are also more difficult to recruit for interviews; therefore, perspectives from PARO particularly those disconnected from community services, may be underrepresented. Although the report includes responses from a diverse range of community members and service providers, some sectors may have been underrepresented or not included. Time constraints limited opportunities for community validation or member-checking, which may have strengthened accuracy and interpretation of findings. Finally, given the volume of data generated from 29 interviews, findings reflect the most prominent and actionable themes rather than an exhaustive presentation of all insights.

Objective 5: Interviews with overdose spike response partners - Baltimore City

Objective 5. Conduct interviews with response partners from a variety of settings to gain insights into the Baltimore City overdose spike event response on July 10, 2025.

BACKGROUND

In Baltimore City, testing by NIST of two syringes collected during neighborhood canvassing on July 10, 2025, detected N-Methylclonazepam and fentanyl, with unusually higher concentrations of the illegal benzodiazepine than fentanyl.[3] Other drug paraphernalia (e.g., capsules and glass or plastic vials) tested showed no detectable compounds or only cocaine. No medetomidine was detected. Although no confirmatory laboratory testing was completed for any of the overdose cases, N-Methylclonazepam is hypothesized to be the adulterant linked to the overdose spike event. Therefore, MDH and the Mayor's Office of Overdose Response revised Objective 4 for Baltimore – to gain insights into the overall response to the overdose spike event.

DATA SOURCES AND METHODS

We completed 10 of 12 scheduled KIIs. Key informants were identified by the Mayor's Office of Overdose Response and included representatives from a range of sectors, including non-profit, local and state government health departments. All participants provided verbal informed consent. Each interview lasted approximately one hour.

The interview guide included questions about trends and factors contributing to opioid-related overdoses, available services, barriers and facilitators to accessing these services, experiences responding to the overdose spike event, lessons learned and opportunities (**Appendix M**).

Key informant interviews conducted in Baltimore City were analyzed separately. We employed the same rapid qualitative analysis as used for the medetomidine-related interviews in Cecil County.

RESULTS

Analysis of interview data yielded 7 key finding areas: current overdose trends and factors contributing to changes in opioid overdoses; existing services; facilitators and barriers; response strategies and strengths; overdose spike event opportunities; lessons learned; and strengthening response capacity. These findings provide context and understanding of the response, as well as identify opportunities and gaps.

1. Overdose Trends and Factors Contributing to Changes in the Opioid Overdose Rate

Interviewees identified two overarching trends in the opioid overdose rate in Baltimore City:

Decline in overdoses and overdose deaths

Overdoses and overdose deaths were lower in 2024 compared to previous years. This decline was reported statistically as well as anecdotally; older Black men continue to be at the highest risk of fatal and nonfatal overdoses. The overall decrease in overdose deaths varied by geographic location with West Baltimore reporting a greater number of overdose deaths compared to East Baltimore.

Shifting makeup and consumption of drugs

Fentanyl and benzodiazepines have been the most prevalent drugs in Baltimore City's supply for the past four to five years. Prior to this, heroin and cocaine dominated the market. While the market is still largely driven by fentanyl, the city is seeing increases in heroin, carfentanil, cocaine, and stimulants. The city is seeing an increasing trend of mixing benzodiazepines with fentanyl as well as market competition between

the two drugs. There is speculation that the rise in benzodiazepines is likely the result of diversion of legal prescriptions obtained from mental health providers. Notably, the route of administration of opioids has shifted with more people smoking and inhaling opioids.

Interviewees noted four key factors contributing to overall changes in opioid overdose trends in Baltimore City:

Overdose response landscape

The availability of community-based overdose prevention services, such as ORPs, was described as contributing to declines in overdose prevalence overall and in 2024. These programs distribute prevention materials, such as drug testing strips and naloxone, reducing overdose risk. The use of "train-the-trainer" model for overdose education further supported reductions by increasing knowledge transfer within impacted communities. Community partners also described active monitoring and rapid response to changes in the drug supply, particularly in areas experiencing increases in overdoses. However, two factors were noted as limiting these efforts: limited access to treatment for fentanyl cravings and shifts in the overall community response structure, particularly related to public safety. Increased law enforcement presence and heightened enforcement of drug-related offenses were perceived as potentially undermining trust between PARO, community members, and the organizations working to build and sustain those relationships.

Challenges in public safety partners' reporting

At the same time, concerns were raised that the city faces challenges in identifying drug supply issues and accurately capturing overdose events, potentially leading to underestimation of the true burden overall. While law enforcement monitor supply shifts, there is often a lag time in identifying changes in the supply as compared to on-the- ground community partners who are more immediately aware of local supply changes. The other main issue relates to counting and reporting of overdoses by EMS and ODMAP. When EMS is called to the site of an overdose, overdoses are only counted if naloxone is administered. In a desire to build community trust, EMS conservatively administers naloxone, using it only when deemed necessary. This leads to undercounting of overdoses, i.e., failing to capture those individuals who experienced an overdose event but were not administered naloxone. While EMS' intent is to build community trust in its response efforts, this also leads to undercounting and underreporting of overdoses in EMS and ODMAP data.

Overdose rates by geographical location

Differential overdose prevalences and patterns by geographical location were also noted, specifically comparing East Baltimore and West Baltimore. Overall, more overdoses occurred in West Baltimore than East Baltimore. A higher prevalence of IV drug use was observed in West Baltimore as compared to East Baltimore; a substantial increase in demand for syringe distribution in West Baltimore as compared to East Baltimore was noted. West Baltimore's open market and open use of drugs also contributed to higher overdose rates than observed in East Baltimore. While both East and West Baltimore attributed increased overdose rates to the changing drug supply and emerging adulterants within the supply, this factor substantially impacted overdose spike prevalence in West Baltimore, specifically in the Penn North neighborhood.

Volatility in the drug supply

Changes in the city's drug supply are suspected to contribute to overall opioid overdose rates. Interviewees described concurrent increases in fentanyl and benzodiazepines; increases in heroin, carfentanil and cocaine; the regular introduction of novel substances and adulterants; and evolving patterns of polysubstance use. Testing data were described as consistent with these observations: 90% of analyzed samples included fentanyl, with additional detection of methamphetamines and xylazine, and approximately 18–20% of community samples contained stimulants.

2. Services Offered

Overdose prevention services

Naloxone education and distribution were the most common overdose prevention services offered to Baltimore City residents and are provided by behavioral health and public health entities, libraries, and community-based organizations. Other services include opioid associated disease prevention, drug checking, overdose education, distribution of overdose prevention resources, and drop-in centers that provide services including showers and laundry, peer support, and medical care. There is one brick-and-mortar drop-in center; the center offers services in person and through street outreach, utilizing a mobile van. In addition to meeting the community's more immediate needs, the drop-in center has also established an overdose response protocol. Key to engaging PARO, the mobile unit is seen as a trusted resource within the community; this trust allows the mobile unit to engage individuals who prefer not to utilize drop-in center services. The local behavioral health entity also provides overdose prevention training and direct support to outreach programs

Substance use treatment services

Baltimore City centers individuals with lived/living experience who work collaboratively with trained PRS to more effectively provide substance use treatment services to PARO. Along with engaging adults who use drugs, PRS also work with juvenile services and youth development programs. Similar to provision of overdose prevention services, case managers and PRS provide services for unhoused PARO and connections to other needed wraparound services. Providers recognize that connecting individuals to supports and services is grounded in relationship building, trust, and transparency and they aim to engage PARO with dignity and respect. Baltimore City overdose prevention providers noted that substance use treatment options for PARO include community based, low-barrier access to MOUD, including buprenorphine.

Public health entities provide coordinated, low-barrier service options to PARO, including:

- Anxiety and depression management
- HIV, hepatitis, and other sexually transmitted infection care
- Primary care
- Vaccinations
- Wound care
- Housing
- Health insurance enrollment
- Access to vital records
- Bridges to care for individuals discharged from hospitals or leaving detention centers

Other services provided

To support individuals seeking or engaged in substance use treatment, libraries, community-based overdose providers, and low-barrier clinics provide additional wraparound services, including:

- Violence prevention programs focused on conflict mediation
- Case management
- Mental health services in collaboration with credible messengers and PRS
- Youth and peer mentoring opportunities using credible messengers
- Leadership and entrepreneurship training
- Workforce training
- Earn-while-you-learn opportunities
- Programming to train and license peer navigators
- Housing resources
- Legal services, including immigration services

- Access to primary care options such as onsite blood pressure screenings and referrals to providers
- Computer access and job application completion
- Bus passes
- Referrals to treatment options
- Naloxone training
- General life skills and goal setting training

Office of Overdose Response

Baltimore City's Office of Overdose Response consists of two main components (1) overseeing overdose and substance use funding and coordinating overdose response efforts, without directly providing programming or services, and (2) monitoring grantees, offering technical assistance in community building and organizing, and supporting communication efforts.

Unmet service needs

Long-term recovery options and mental health resources are limited. A lack of programming to address both housing and mental health was noted; walk-in mental health centers could fill this gap. Access to therapists, in addition to psychiatrists, was seen as essential; interviewees noted that medications alone are not always sufficient treatment for individuals with substance use issues. As well, parsing out pre-existing serious mental illness from mental illness resulting from drug use is important to inform plans of care. A lack of linkage to care, especially following hospital discharge to the community, is an ongoing need in Baltimore City. Specifically, long-term recovery is rarely offered to PARO; typical participation in a 30-day treatment program is considered too short to change individuals' lifestyles, including drug use patterns.

3. Facilitators and Barriers

Both facilitators and barriers in access to overdose prevention services and in access to substance use treatment services were identified.

Facilitators of access to overdose prevention services

Primary facilitators of access to overdose prevention services focuses on use of PRS—trained individuals with lived/living experience—and creating safe spaces where PARO can receive assistance accessing wraparound services. PRS are viewed as essential to effective, compassionate engagement with PARO. Community-based overdose prevention providers and community libraries emphasize the benefits of working with PRS. While Baltimore City libraries initially instituted a zero-tolerance policy regarding PARO, they now intentionally turn libraries into safe spaces, providing an array of supportive overdose prevention services to PARO. Use of opioid restitution funds and grants to enhance outreach services in areas of highest need also facilitates provision of overdose prevention services.

Barriers in access to overdose prevention services

In Baltimore City, implementation of overdose prevention services is challenging. The involvement of partners at both local and state levels increases the complexity of service delivery. Interviewees described statewide management of ORPs as unclear and lacking local context, with several suggesting that oversight may be more effective at the local level. Additionally, while many services exist in the Penn North community, there is a lack of coordination and effective communication across providers. As a result, outreach initiatives tend to develop organically, based upon client feedback rather than being organized and coordinated in a systematic way. Furthermore, funding issues exist that impact implementation of overdose prevention city-wide. Financial considerations such as delaying finalization of grant funding have proved a barrier to providing needed overdose prevention services.

Facilitators of access to substance use treatment services

Providers stressed the ongoing need to engage PRS to facilitate access to substance use treatment services and to provide essential support in overdose responses. Benefits of PRS involvement include their

proximity to PARO as well as their familiarity with and trust among this population. Beyond suicide prevention, Baltimore City also promotes #988 as an opportunity for linkage to care. Upon calling, individuals are referred to or set up with appointments for substance use treatment, detoxification treatment, facility-based substance use crisis stabilization, and inpatient mental health crisis stabilization. Some Baltimore City providers believe that there is adequate treatment programming across the spectrum of substance use care, noting that individuals understand where to access different types of care. Baltimore City providers use the Assertive Community Treatment (ACT) model, prioritizing enhanced quality of life for those with substance use and other serious behavioral health conditions by facilitating community integration, reducing unstable housing, and decreasing substance use among PARO. Using opioid restitution funds, Baltimore City is setting up its first 24/7 drop-in center where PARO can do laundry and connect to resources. The city aims to open centers in multiple locations in high-impact areas identified using available overdose data.

Barriers in access to substance use treatment

While some providers stated that PARO know how/where to access substance use treatment options, others described a lack of access to quality treatment in Baltimore City. Examples include:

- Limited treatment centers for wound and other substance use-related specialty care
- Lack of awareness of where to find same-day treatment providers
- Presence of recovery homes seeking to exploit individuals looking for substance use treatment
- Long wait times for admission to quality treatment facilities
- Lack of 24/7 services
- Need for additional low-barrier access service providers

Funding is another barrier to accessing substance use treatment. Availability of local resources and coordination of services such as referrals and linkages to care were described as siloed and segmented, partly resulting from competition for scarce resources. Referrals often occur through relationships, not a systematic process. This competition for resources hinders effective collaboration and streamlined referrals. To address this barrier, interviewees suggested that the city develop a centralized way to share information related to substance use services and the availability of these resources. Unstable funding is another barrier to providing comprehensive substance use care. Interviewees noted that this issue might be solved by establishing long-term, continuous funding for substance use treatment programing.

Discrimination and negative attitudes or beliefs about PARO are also a barrier to substance use service provision. Community members are often wary that services located in their community will attract individuals perceived as “undesirable.” An increase in housing instability among PARO heightens this concern. Some neighborhoods actively push people seeking substance use care out of their neighborhoods. Long wait-times for admission to treatment centers due to a lack of available beds in quality facilities contributes to community perceptions of loitering by PARO. Suggestions to decrease negative attitudes and beliefs around individuals seeking substance use treatment include utilization of PRS and people with lived/living experience as well as obtaining letters of support from communities where substance use services are concentrated. To better support individuals in need of substance use treatment, developing additional, integrated low-barrier programming that can provide more timely respite services, bridges to long-term recovery, services to address social determinants of health, and safe living environments are needed.

Other notable barriers in accessing substance use treatment include:

- Regulations and referral processes that make it more challenging for PPW to access higher-intensity residential treatment programs with childcare and family-centered services; many facilities no longer accept PPW because of the guidelines and capacity challenges in meeting ASAM criteria and state requirements

- Challenges in connecting individuals who use alcohol and/or benzodiazepines to care due to concerns related to withdrawal symptoms; many facilities are not medically equipped to treat such individuals and are wary of assuming the risk of doing so
- Limited or no appropriate medical follow-up for individuals receiving methadone
- Lack of transportation to travel to and from appointments
- Lack of cell phones among PARO, limiting their ability to call #988 for help
- Concern that substance use services provided may not align with Administration priorities, putting substance use treatment at risk

4. Response Strategies and Strengths

Response components

Baltimore City's rapid response efforts included clinical and public health components. The clinical component addressed stabilization of individuals experiencing an overdose. This primarily occurred through EMS intervention; EMS provided supportive care and transport to medical facilities as needed. The public health component involved neighborhood canvassing and, in collaboration with public safety, identification of high-risk areas (transit centers, alleyways, abandoned buildings) where individuals experiencing an overdose are most likely to be found. The public health component also focused on rapid obtainment and distribution of resources, including hygiene kits, naloxone, food, and water. Importantly, a local library was converted into a home base for all overdose response efforts. This was due to the centrality of the library's location as well as community members' perception of it as a safe space. Concurrent implementation of clinical and public health responses resulted in the city feeling well-prepared and with access to necessary materials and resources. While some responders reported having adequate naloxone for distribution and the requisite equipment and personnel to robustly respond to the overdose spike event, others described challenges obtaining necessary supplies, suggesting a lack of clarity in resource distribution or stock availability.

Leveraging existing protocols and partnerships

In response to the unfolding overdose spike event, Baltimore City launched an existing emergency protocol, co-developed by public health and first responders. The city's Emergency Preparedness Program activated their mass casualty program and implemented an incident command structure before transitioning to a health-focused response. Many of the providers carrying out the rapid response had substantial experience and had already established working partnerships. For example, many of the same partners collaborated in response to the COVID pandemic. The Baltimore City Fire Department also contributed to the July 10 overdose spike response event effort. As part of their normal daily activities, the fire department's paramedics conduct proactive overdose response activities; this experience was leveraged during the overdose spike event. Similarly, as part of their daily operations, community-based overdose prevention providers were prepared to respond and contributed to on-the-ground efforts; the providers are well-trained and have deep connections to the communities they serve. Other public and behavioral health entities such as the Mayor's Office of Overdose Response and MDH contributed to response activities. The Mayor's Office addressed communications needs to keep partners and the city informed of unfolding events.

Rapid mobilization of cross-sector partners: an "all-hands-on-deck" approach

Baltimore City was able to quickly mobilize a range of partners to address different aspects of the rapid response. The breadth of response from partners met the many needs of individuals impacted by the event. The following is a non-exhaustive list of partners participating in the July 10 overdose spike response:

- Public library
- Baltimore City Health Department (BCHD)
- Office of Emergency Management

- ORP
- First responder teams
- Community-based overdose prevention outreach teams
- Mayor's Office of Overdose Response
- Local Behavioral Health Authority
- PRS
- Fire department paramedics
- Street-based outreach organizations
- EMS units and ambulances
- Law enforcement
- Social workers
- Community-based organizations
- Telemedicine clinicians
- 911

Flexibility and coordination of response partners

Nimbleness of response partners was key to successful execution of response efforts such as the rapid standup of one of the city's libraries as a home base for response planning and execution. An incident manager was quickly identified on scene. Social workers based out of the repurposed library provided individuals with mental health support. First responders were onsite at the library to provide medical intervention as necessary. A makeshift medical monitoring triage unit was created at the library to address the needs of individuals declining medical transport. Food, water, a cooling bus, naloxone, and other resources were also available at the library for impacted individuals.

Public health organizations already conducting community outreach were quickly diverted to respond to the overdose spike event; this included mobilization of a population health team and a mobile van as well as collaboration with community organizations, the Local Behavioral Health Authority, and city leaders to strategically deploy partners. Community-based overdose prevention teams operating in the field on the day of the overdose spike event were made aware of the situation and quickly pivoted to assess the response landscape and offer services in impacted areas, at times in collaboration with other community providers. PRS were rapidly deployed to impacted neighborhoods to provide naloxone, education, and other supports. EMS and ambulances remained on standby at the makeshift monitoring unit to provide support and transport if an individual's status worsened. Roles were quickly defined with some first responders remaining onsite and others canvassing in the community. In response to emerging needs, the response operation expanded to include a telemedicine component accessible to all canvassers. Individuals and teams in the community could call for help; telemedicine-based providers were available to answer questions.

EMS and many other first responders were quick to respond and rapidly managed the situation on-the-ground. EMS was perceived to have effectively coordinated medical care and naloxone administration, demonstrating flexibility in addressing emergent needs. Responders leveraged existing relationships to facilitate a quick and coordinated response. The lack of fatalities on the day of the overdose spike event—a notable success—was attributed to the robustness of response efforts and the collaboration of partnerships pre-dating the July 10 overdose response.

Credible messengers and community trust

In large part, the success of overdose spike response efforts on July 10 resulted from community outreach by credible messengers who, over time, worked to build trust among community members and within the impacted community; these relationships pre-dated the overdose spike event. For example, as a direct result of a long-term relationship, a community-based overdose prevention provider received a text message from a community member of 16+ years, alerting the provider of the overdose spike event.

Community-based overdose prevention providers leveraged their strong ties to the community to reach impacted individuals, especially in harder to find or less obvious locations. An informal, trusted group of individuals associated with a low-barrier clinic serving the impacted community were also key in communicating with individuals about the overdose spike event. Canvassers connected impacted community members to critical services and supports; they are familiar with neighborhoods and have successfully developed strong, trusting relationships with PARO. Community-based trusted messengers, canvassers, and providers proved vital in reaching individuals, transitioning them to care, and/or providing supportive services and overdose education. Community organizations played a central role in facilitating partner introductions, improving access to life-saving treatment, and making canvassing easier for those responders less familiar with the community.

Shared values

Another response strength centered on the perception of a shared experience. Response efforts fostered more collaborative relationships with local organizations based on respect and shared values. Community-based organizations felt empowered and encouraged in their efforts by working alongside other organizations and individuals that shared the same commitment to the community. During the rapid response, the neighborhood coalesced around a common goal and vision.

5. Overdose Spike Event Opportunities

Improved Collaboration

Although collaboration was widely described as a strength, interviewees also identified opportunities for improvement. Several noted that longstanding competition for limited funding has historically hindered collaboration between organizations, and the overdose spike event may have created opportunities for predatory providers. Some responders reported encounters with providers offering naloxone or other resources in exchange for enrollment in their services, raising concerns about exploitation, safety and provider qualifications. These experiences underscore the importance of sustained, values-driven partnerships that prioritize ethical engagement, share resources, expand reach, and coordinate care by filling gaps collectively rather than mobilizing only during emergencies.

Many of the reflections on state and local collaboration highlighted the need for improved communication and coordination between levels of government. The necessity of improved collaboration between the Baltimore City's Mayor's Office and the MDH was explicitly noted by interviewees. The state is perceived as lacking situational awareness of on-the-ground response efforts and of community-specific needs. MDH is also perceived as lacking close relationships with local responders. These informational and relational gaps on the part of the state were noted as making an already difficult, highly stressful response effort more challenging. Conflicts between the state's eagerness to assist with response efforts without the requisite situational awareness were also interpreted by some local partners as overreach. The state was motivated to provide support, however, local responders believed that Baltimore City itself knew best how to conduct response efforts given their more granular understanding of the community's needs. One possible solution voiced by interviewees focused on building out a robust crisis system that would be locally informed but developed with assistance from the state.

Standardized protocols

Interviewees discussed the need for building processes and infrastructure to standardize rapid responses to support a more coordinated approach during future overdose spike events. Interviewees acknowledged that while many services exist in the Penn North neighborhood, the city lacks a coordinated and effective response protocol. A list of programs and their contact information would be useful to identify, notify, and deploy programs operating closest to the scene of the event. Four to seven organizations consistently work in the community but, for the most part, do not collaborate outside of emergencies; when overdose spike events occur, the gaps in partnerships highlight the strengths of individual organizations as well as difficulties in collaboration. One proposed solution to address this gap is the creation of temporary drop-in

center during overdose spike events to coordinate response efforts and provide support to affected community members. A centralized operations phone line to coordinate response efforts was also suggested. Development of a protocol to notify and support ORP response efforts, specifically to increase oversight of ORP by local entities in addition to oversight by the state, was also an idea proposed by interviewees. The increased coordination resulting from a standardized protocol would also lessen the chance that too many individuals respond at a given time as well as minimize the confusion related to individual and organizational roles and responsibilities during a rapid response.

Improved communication

Communication at multiple levels was cited as an area that may need improvement. There is an overarching need for a stronger communications strategy that could address what is and is not known about overdose spike events; ideally, this information would come from trusted messengers with knowledge of events in their community and could be part of a universal alert system to ensure consistent and ongoing communication among responders and other relevant partners. Part of this strategy could include use of walkie-talkies to share consistent messaging on events in real time. Also noted was room for improvement in communication between the city and state as many partners found the process confusing. In general, the chaotic conditions interviewees described made initial communications challenging, especially in defining responder roles and responsibilities.

The other communications gap raised by interviewees related to the media. For example, the media initially reported that the drug causing the overdose spike contained antifreeze; this was incorrect, however, the media's messaging was not modified after their initial report. The media never clarified with the public what was in the substance of concern. Interviewees saw this communication issue as an opportunity to work with the media for more accurate messaging during future overdose spike events and highlighted the need for staff training on considerations when interacting with the media.

Supply access and messaging

Given variability in perceived supply availability, interviewees described some of the challenges in obtaining supplies to address the July 10 overdose spike event. Responders ran out of available ambulances. Responders also needed clarity on where to obtain naloxone locally. They also described mixed messaging regarding the amount of naloxone needed to adequately address community demand. More drug testing strips were needed, particularly for benzodiazepines. A better inventory of stock would improve knowledge of the location and available quantity of response supplies. An interviewee suggested implementing a more consistent model of sharing supplies in combination with training on the types of equipment needed across various response scenarios.

Data access and interpretation

Several data-related issues were raised by interviewees. Those collaborating on the July 10 response were unable to compare current data to prior months due to data suppression rules. This was further complicated by reports from ODMAP that did not reveal any anomalies that could inform responders' understanding of the overdose spike. Procedural and logistical issues delayed drug sample testing; although preliminary results were eventually obtained from NIST, they were not broadly disseminated to response partners. Law enforcement also had capacity to conduct field drug testing; however, interviewees noted that results were not readily shared with those working on the response. Without this data, uncertainty remained regarding the specific substances involved in the overdose spike. The collaboration between the local government and agencies and MDH was also cited as challenging. Specifically, the state health department may lack sufficient understanding of how the city conducts overdose surveillance, which data are available, how to use the data, and how the data are communicated. Overall, interviewees recommended creating a more efficient way to collect and report data to better inform response efforts in real time.

6. Lessons Learned

In speaking with interviewees, they identified the following lessons learned following execution of July 10 overdose response efforts:

Need for increased trust building and collaboration between the community, public health, and public safety

Interviewees described increased law enforcement presence prior to and during the overdose spike event as a factor influencing response dynamics. Interviewees reported that heightened law enforcement activity, particularly targeting low- and mid-level drug supplies, contributed to community fear and made outreach work and trust building more challenging. While well-intentioned to support public safety and response efforts, law enforcement involvement was not always received positively; fear of law enforcement drove some residents further into hiding, hindering on-the-ground responders' ability to locate and assist them. Interviewees stressed the need to incorporate and balance shared public health and public safety goals.

Sustaining momentum

Interviewees reported that residents of the Penn North neighborhood described their experience of growing up and living in the community as generational trauma, with community members expressing feelings of disenfranchisement and being underprioritized. They noted that the lack of stable resources available to the community stalls long-term progress. This lack of resources was brought to light by the July 10 overdose spike event. Community members noted that resources typically flood their neighborhood during a crisis but quickly dry up post-event, leaving the community without sustained attention to their needs. Providing ongoing support to the community was noted as critical to ensure lasting community change. The lack of consistent, long-term support and ongoing access to resources in the community impedes long-term progress, frustrates community members, and hinders collaboration between organizations competing for the same limited funds. Community members were also dubious that increased discussions among city officials would lead to substantive improvements in their community.

Continuing overdose prevention work

Overdose prevention work is not new to the community. Prior to the July 10 overdose spike event, community outreach, use of PRS, and an on-the-ground presence were already in place. Community-based overdose prevention providers stressed their plan to continue to prioritize familiarity with community members and their needs, maintain a presence in the community, conduct their work locally, and engage people with lived/living experience to facilitate overdose prevention work. While community-based overdose prevention providers noted that their services were available prior to July 10, they did note changes and opportunities in their work. Insights included increased awareness of other local organizations interested in collaboration, the ongoing need for training and continuing their general preparedness work, and the need for continued trust and relationship building in the community. They also found the swell and magnitude of response efforts surprising, highlighting the importance of ongoing engagement and the need to sustain their overdose prevention work. Another notable takeaway was how the response led to increased awareness among both family members and the community at large of the use and benefits of naloxone and drug testing strips as tools to save lives; community members described heightened awareness and curiosity about overdose prevention work in their community.

Refining response efforts

Following the July 10 overdose spike event, state and local representatives recognized the need for a more robust rapid response protocol. While a mass casualty protocol existed and was exercised prior to the overdose spike event, representatives realized that the protocol needed to be updated. This includes formalizing overdose spike response efforts, improving communication systems, identifying a person or entity to coordinate response efforts, and conducting interagency incident command trainings.

Interviewees expressed interest in utilizing the expertise of an objective third party to evaluate the response effort, refine the protocol, and provide additional recommendations.

The overdose spike event also highlighted the need to revisit the protocol's criteria, specifically identifying case thresholds when determining if increases meet the definition of an overdose spike event. Other needs included measuring overdose spike event severity, determining when an overdose spike event is stabilized, defining response goals, identifying areas of greatest need, and effectively distributing resources. Specifically, representatives noted the need to create a tiered system to allocate resources based on overdose spike event severity. Overall, representatives planned to evaluate their response protocol to identify response facilitators, barriers, implementation challenges, lessons learned, and corresponding areas for improvement. Community partners expressed a need to conduct quarterly response training, implement a system to inventory their overdose response equipment, and determine ways to streamline both their team responses and allocation of equipment. Peer-to-peer learning was another area of interest among interviewees. They expressed interest in learning more about Cecil County's ability to detect changes in overdose incidence as well as to better understand the county's collaboration and coordination efforts in addressing medetomidine withdrawal. One other idea interviewees voiced was the establishment of a co-responder model; the model prioritizes inclusion of people with lived/living experience. Those with this lived/living experience could be an integral part of the overdose spike event response by supervising and managing response efforts alongside trained professionals.

In response to lessons learned from the overdose spike event, the BCHD released an overdose strategic plan for public comment; based on feedback, the health department plans to develop an implementation plan for broad dissemination. With the intention that "you can never be too prepared," the health department will conduct a tabletop exercise and offer more response trainings. They also participated in a hot wash to debrief on their response to the July 10 overdose spike event. Other insights from the overdose spike event focused on the need for improved leadership within and collaboration between the local behavioral health entity and the BCHD; understanding roles across both entities and ways to more efficiently collaborate was noted as a priority.

Using data to better inform response efforts

In response to the overdose spike event, state and local representatives identified the need to make better use of existing data sources. BCHD noted the need to revise their overdose definition; currently, nonfatal overdoses are defined and tracked as those individuals who responded when administered naloxone; this likely leads to a substantial undercount of nonfatal overdoses. BCHD relies on daily EMS overdose notifications as indication of potential changes in the drug supply, including reports of new or atypical symptoms that may reflect emerging substances. Interviewees identified opportunities to better leverage existing drug-checking data such as RAD and strengthening engagement with Johns Hopkins University's drug checking van to improve understanding of shifts in the local drug supply Syndromic surveillance is also a tool that could be better utilized to inform and improve response efforts; ESSENCE data could be more effectively used to provide near real-time, aggregated data for cluster analysis and to identify overdose counts greater than an expected threshold.

7. Strengthening Response Capacity

Interviewees identified the need for additional resources and supports to strengthen their response work. Resources broadly included an increased need for:

Medical services

The need for a trauma center and increased access to EDs and ambulances were cited as opportunities to strengthen response work.

Providers, peers, and treatment services to address mental health and substance use issues

Interviewees identified the need for additional detoxification beds and a more efficient way to locate available treatment beds. SUD treatment programs are currently managed at the state level, however, those interviewed felt it would be beneficial for local level partners to have more oversight of the programs. For those struggling with substance use issues, the use of #988 versus face-to-face communication also came up during interviews. While the benefit of access to #988 was acknowledged, interviewees also lobbied for additional face-to-face walk-in options. Suggestions included recovery houses, other facilities with walk-in capacity and additional drop-in centers where individuals can connect in-person with a provider or peer.

Peer services were broadly supported; one example is the need for operation of peer programs on a 24/7 basis, however, a lack of funding limited sufficient staffing to meet overdose demand. Peer programs to ensure continuity of care for patients, from EMS interactions to hospital visits and admissions to warm handoffs upon discharge, were also limited as these programs do not currently operate on a 24/7 basis. A lack of adequate mental health service providers, both clinicians and peers, for individuals struggling with behavioral health issues was highlighted. Interviewees called for more comprehensive community-based overdose prevention providers that offer in-person overdose prevention and wraparound services, including outreach in vulnerable neighborhoods to support at-risk community members.

Wraparound services

Consistent with the needs articulated above, wraparound supports provide individuals with the opportunity for sustained, effective treatment and recovery if desired. Among interviewees, the most needed wraparound services included safe, stable housing; food and hygiene kits; and 24/7 access to showers, meals, and help with essential services such as obtaining identification materials. Family reunification support was also identified as a need; such support can aid in communication and connection to loved ones during the recovery process.

DISCUSSION

Although these findings reflect the perspectives of a subset of overdose spike response partners, they highlight both strengths and opportunities within an evolving overdose and response landscape in Baltimore City. This landscape is characterized by declining deaths alongside demographic and geographic variability and an increasingly volatile drug supply. While expanded monitoring, education, and prevention efforts across sectors have contributed to improved outcomes, shifts in the drug supply are placing new demands on government agencies, public safety, first responders, community-based organizations, healthcare systems, and public health–pressures that became evident during the July 10 overdose spike event.

Baltimore City's overdose and substance use service landscape including community outreach, opioid associated disease prevention services, drug checking, naloxone distribution, MOUD, drop-in centers, and wraparound supports, enabled rapid, multisector mobilization grounded in established partnerships and community trust. At the same time, the event exposed vulnerabilities including gaps in organizational and cross-jurisdictional coordination, response protocol standardization, communication, and resource allocation.

Persistent systemic gaps also remain, including unstable funding, distrust of law enforcement, limited long-term recovery options, insufficient mental health and behavioral health integration, and negative attitudes and beliefs towards PARO. Findings underscore the need to sustain overdose prevention efforts beyond crisis periods and to address broader structural issues, including housing instability, neighborhood disinvestment, food insecurity, and access to care. Strengthening overdose response will require enhanced surveillance integration, clearer role definitions, standardized response protocols, and sustained

investment in trust-centered, community-based approaches capable of adapting to an evolving drug supply.

RECOMMENDATIONS

1. Adapt overdose response and naloxone protocols

Naloxone remains a highly effective intervention for reversing opioid overdoses and might continue to be widely distributed and promoted, especially to PARO and their social networks. Education might be expanded for providers, first responders, PARO, and families on appropriate dosing, repeat administration, rescue breathing, CPR, the Good Samaritan law, and post-reversal monitoring, particularly in the context of reduced responsiveness and prolonged sedation associated with emerging adulterants.

Guidance and training should clarify that if a person resumes breathing (at least one breath every five seconds and is not pale, gray or blue) but remains sedated and unresponsive following naloxone administration, naloxone is likely effective and additional or higher doses are not indicated.[50,53] Overdose response guidance might reinforce calling 911, symptom-based management (e.g., reassessing signs and symptoms, and administering rescue breathing if an individual is breathing less than one breath every five seconds), monitoring, and transitioning care to EMS/hospital when naloxone response is delayed or incomplete.

2. Expand overdose education for PARO, families and communities

MDH, LHDs and partners might expand education on overdose prevention, including strategies to prevent overdose, recognize and respond to overdose, and identify the need for higher level care. Education needs to reflect the evolving drug supply and emphasize risk-reduction strategies in the presence of sedative adulterants. Education might also aim to address fears and misinformation that may lead PARO to delay or avoid care. Supplies, including hygiene products, drug test strips, and wound care products, might also be made available. In addition to calling 911, the Maryland Poison Center might be emphasized as a free, valuable resource for PARO, families and communities, providing 24/7 to poison experts who can offer guidance during suspected or unusual overdoses.

3. Sustain community-based engagement and clarify response roles, particularly between state and local government

Maintaining a consistent, trust-centered presence in communities may strengthen overdose prevention and response beyond crisis periods. Ongoing outreach—including overdose education, naloxone distribution, and engagement with PARO—can function as routine practice rather than being limited to overdose spike events. Community-based organizations are often well positioned to lead outreach given established trust and credibility, while state and local oversight agencies provide coordination, resources, and technical expertise.

Clarifying and aligning state and local governmental and public health roles across substance use, mental health, and behavioral health systems may further strengthen coordination and improve overdose prevention and response efforts. MDH might lead statewide coordination, technical assistance, and cross-jurisdictional communication, while LHDs implement community-level prevention and response through local partnerships using state-supported guidance and resources. Clearly defined roles, responsibilities, and points of contacts of organizations within response protocols may enhance preparedness for future overdose spike events. Resources include:

- Maryland Commission on Public Health - Building the Future of Maryland Public Health 2025 Final Report

- National League of Cities - Aligning City, County and State Resources to Address the Opioid Epidemic: Lessons Learned and Future Opportunities
- NACCHO – Stakeholders and Partnerships, Opioid Overdose Epidemic Toolkit for Local Health Departments
- National Association of Counties: Promoting Health and Safety Through a Behavioral Health Continuum of Care
- Public Health and Safety (PHAST) Toolkit: Guidance for Data-driven Overdose Response Coordination Among Public Health, Criminal Justice, Law Enforcement and First Responders
- Training and Educating Public Safety to Prevent Overdose Among Black, Indigenous, and People of Color Communities

4. Strengthen overdose surveillance and data integration

Overdose surveillance in Baltimore City may be strengthened through routine integration and triangulation of multiple data sources including EMS notifications, community-based overdose prevention programs, MPC, RAD, Johns Hopkins University's drug checking van, medical examiners' investigations, and fatal review boards. Enhanced data-sharing agreements and real-time communication pathways could improve situational awareness and support timely response.

The LHD and local government might continue leveraging partnerships, such as the Overdose Response Strategy, to exchange timely drug trend intelligence. Incorporating overdose biosurveillance can further support providers, particularly when new or atypical symptoms emerge alongside increases in nonfatal overdoses (See Objective 2). Greater integration of these systems may facilitate earlier detection of emerging substances and more proactive, data-informed responses. Additional resources that provide regular timely drug trend data:

- National Drug Early Warning System (NDEWS) – national drug trends
- Center for Forensic Science Research and Education (CFSRE) – national trend reports on novel psychoactive substances (NPS)
- U.S. Drug Enforcement Administration's National Forensic Laboratory Information System - data and trend information on controlled and noncontrolled substances identified through law enforcement drug seizures nationwide
- National Poison Data System Surveillance System – national insights to poison exposure management, including illegal substances and commercial products

5. Strengthen overdose spike response infrastructure

Baltimore City could consider establishing a standardized, locally informed, state-supported response protocol that considers:

- Developed operational definitions and response criteria for spike event identification, severity assessment, and stabilization
- Formalization and incorporation of ambulance shortage protocols and local stabilization area models to ensure sustained surge capacity and support for individuals who decline EMS transport
- A centralized operations phone line to streamline coordination during spike events
- A centralized list of programs with contact information to support rapid strategic notification and deployment
- A standardized supply distribution process and improved inventory tracking for naloxone and response equipment; organizations might need to receive technical assistance to establish their own response protocols and inventory tracking
- Training might be provided on equipment needs and roles across varying response scenarios

Several frameworks exist that can be used to guide overdose spike planning and response work, including:

- ODMAP's Overdose Spike Response Framework
- NACCHO's Overdose Spike Response Framework for Communities and Local Health Departments
- ASTHO Responding to an Overdose Spike
- CSTE Overdose Anomaly Toolkit

Additional considerations include exploring a co-responder model that integrates individuals with lived/living experience into overdose spike response efforts. Beyond post-response reviews, gathering feedback from community members on the response process may help ongoing refinement of protocols and strengthening of response structures.

6. Improve communication

Standardized communication protocols during overdose spike events could help clarify what is known, unknown, and evolving, supporting more consistent messaging across levels of government, response partners, and the public. Clear articulation of roles, responsibilities, actions underway, and identified needs—particularly among agencies with oversight functions—may further enhance coordination. Clarifying points of contact and communication pathways between city and state agencies could reduce confusion during response efforts. Media engagement training for partners may also support accurate and consistent public messaging during overdose spikes or crisis events.

7. Improve service coordination and strengthen linkages to care

Given the number of substance use resources in Baltimore City, development of a centralized, regularly updated system to share information on available services and capacity may help improve awareness and coordination across organizations.

Improved communication between hospitals, outpatient providers, residential programs, and other community services is needed to support safer transitions of care. Enhanced discharge planning, shared expectations around treatment and recovery, and clear referral pathways can improve continuity, reduce premature discharge or readmission, and increase engagement in treatment and community-based overdose prevention services.

Continued integration and expansion of PRS, social workers and care coordinators across care settings can facilitate these transitions. The lived experience of PRS provides critical support for PARO and serves as a bridge between patients and providers, improving engagement, trust, and linkage to services during high-risk periods, including post-overdose and post-discharge. Baltimore City can explore existing programs in other jurisdictions, such as Cecil County's S-PED, PORT or Mobile Integrated Health team, as models to integrate PRS, strengthen care coordination across settings and improve linkage to services. Resources include:

- Overdose Response and Linkage to Care: A Roadmap for Health Departments
- ASTHO Strengthening Community-Clinical Linkages to Improve Health Outcomes: Convening Summary
- CDC Linking People with Opioid Use Disorder to Medication Treatment

8. Continue to support and expand access to care, especially in settings where people's vulnerability to overdose is heightened

Access to timely, coordinated, and person-centered care is essential for individuals at elevated risk of overdose, particularly during high-vulnerability periods such as post-overdose, post-incarceration, hospitalization, or treatment transitions. Expanding low-barrier, integrated service models that reduce

barriers and improve coordination is critical. These efforts might include access to housing, transportation, childcare, mental health services, and other social supports that stabilize recovery and reduce overdose risk. Resources include:

- Brandeis Opioid Resource Connector – Program Models
- ChangeLab and Prevention Institution: Supporting Decision Makers Using Opioid Settlement Funds: Making meaningful Investments at the Local Level
- ChangeLab: Preventing Overdoses and Reducing Drug-Related Harm – A Policy Guide for State and Local Change
- SAMHSA: National Guidelines for a Behavioral Health Coordinated System of Crisis Care
- SAMHSA: Model Definitions for Behavioral Health Emergency, Crisis and Crisis-Related Services
- Evidence-Based Strategies for Preventing Opioid Overdose: What's Working in the United States
- CDC: Evidence-Based Strategies to Prevent Youth Substance Use

Access to MOUD continues to be recognized as a cornerstone of overdose prevention, including availability in jails, prisons, EDs and through low-barrier programs with flexible scheduling and fewer requirements for initiation. Expansion of MOUD and education for both providers and patients regarding the effectiveness of MOUD in the context of polysubstance use and synthetic opioids remains important. Early initiation and continuity of MOUD alongside wraparound services may need to be prioritized across care settings. Resources include:

- Addiction Medicine Toolkit
- CDC Health Care Provider Trainings
- PCSS MOUD Education and Training
- ASAM National Guideline for the Treatment of Opioid Use Disorder
- SAMHSA - Medication-Assisted Treatment (MAT) for Opioid Use Disorder in Jails and Prisons: A Planning and Implementation Toolkit

LIMITATIONS

Although efforts were made to include a diverse range of response partners, sampling limitations remain. Some sectors, including first responders (law enforcement, fire department, EMS) and community voices, were not represented. Additionally, participants were recruited through snowball sampling, which may have limited inclusion of less-engaged or harder-to-reach perspectives and may also reflect crisis-period perceptions rather than longer-term trends. Finally, given the volume of interview data, findings reflect the most prominent and actionable findings rather than an exhaustive presentation of all insights.

Objective 6: Investigate severe symptoms resulting from polysubstance opioid use

Objective 6. Investigate the prevalence, incidence and characteristics of severe symptoms resulting from polysubstance opioid use including sedative adulterants through interviews, medical chart abstraction and other data analysis as available to inform the development of guidance document.

BACKGROUND

For this objective, we sought to better understand the clinical presentation of patients experiencing withdrawal of polysubstance opioid use including sedative adulterants. We used medical chart abstraction to collect data on patients experiencing suspected withdrawal syndrome. We requested access to EHRs to collect patient-level data, and we performed analyses to describe demographics, symptoms, and treatment of the suspect cases.

The initial objective focused on sedative adulterants broadly, but after speaking with the Maryland team we learned that medetomidine was known to be in the drug supply during this time frame. This objective was narrowed to focus on medetomidine as it was believed to be involved in the majority of all cases presenting for care in the hospital.

DATA SOURCES AND METHODS

Case definition development

There is no established case definition for medetomidine-related withdrawal syndrome, so we developed a withdrawal syndrome through literature review[17,20-22,57-61], subject matter expert consultations, and provider and key informant interviews. We started with the selection of clinical criteria for a case definition of medetomidine withdrawal, including an ED or hospital discharge diagnosis of opioid withdrawal, or a diagnosis of sedative or other psychoactive drug withdrawal or clinical signs of medetomidine-related withdrawal. A case definition (**Table 6.1**) was developed, along with classifications for confirmed, probable, and suspect cases.

Table 6.1. Case Definition: Medetomidine withdrawal syndrome

Clinically compatible criteria:

• A discharge diagnosis of opioid withdrawal **OR**
• A diagnosis of sedative or other psychoactive drug withdrawal **OR**
• Clinical presentation for medetomidine-related overdose or medetomidine-related withdrawal syndrome
  ○ Clinical presentation for medetomidine-related overdose may include:
  ▪ Sedation, often prolonged (4-6 hours)
  ▪ Bradycardia
  ▪ Hypotension
  ▪ Large doses of naloxone given pre-hospital (8-10+ mg naloxone)
  ○ Clinical presentation for medetomidine-related withdrawal syndrome may include:
  ▪ Hypertension
  ▪ Tachycardia
  ▪ Nausea
  ▪ Vomiting
  ▪ Encephalopathy
  ▪ Delirium

▪ Shaking/Tremors
Laboratory criteria:
• Confirmatory laboratory evidence (biologic): Positive urine, serum, or other body fluid toxicology screening for medetomidine. • Presumptive laboratory evidence (environmental): Positive screening of a drug or other substance for medetomidine.
Classifications:
• **Confirmed:** A clinically compatible case where laboratory tests have confirmed the presence of medetomidine in a biological sample. • **Probable:** A clinically compatible report where there is 1) a high index of suspicion for medetomidine toxicity and 2) possession of a drug sample positive for medetomidine.   ○ High index of suspicion is defined as: symptoms of tachycardia, hypertension, and/or autonomic instability. • **Suspect:** A case that was evaluated by a health care professional or EMS for opioid withdrawal that aligned with medetomidine-related withdrawal signs and symptoms, but medetomidine was not identified in any biological or drug samples. • **Not a case**: Not meeting any of the above criteria.

Data source

Two Maryland healthcare facilities (Facility A in Cecil County and Facility B in Baltimore City) provided medical charts for patients with suspected medetomidine withdrawal syndrome. The chart abstraction team reviewed 110 charts for patients discharged from facility A and reviewed 10 charts hand-selected by clinicians at facility B. Medical charts from Facility A were selected based on ICD-10-CM diagnosis codes for opioid use or dependence with withdrawal. Medical charts from Facility B were selected charts identified by addiction medicine specialists, for patients with suspected medetomidine use. Specific details for case finding are listed below.

Case Finding: Medetomidine withdrawal syndrome

Case finding: Facility A

Patient population: patients presenting March 1 to April 30, 2025, for suspected medetomidine withdrawal.

Chart selection: We started with ICD-10-CM codes specific to withdrawal and expanded as needed. We searched Cerner medical charts for ICD-10-CM diagnosis codes for:

- Opioid withdrawal: F11.13, F11.23, F11.93
- Sedative withdrawal: F13.13, F13.23, F13.93
- "Other psychoactive substance…withdrawal": F19.13, F19.23, F19.93

Case finding: Facility B

Patient population: patients presenting with a high index of suspicion of medetomidine based on clinical presentation and evaluation.

Chart selection: Charts are identified by addiction medicine providers at Facility B.

Study population

We selected charts for review if they were discharged from Facility A during March 1, 2025–April 30, 2025, and we included all the charts identified by Facility B. Abstracted medical chart visits with medetomidine-related withdrawal syndrome were included in the analytic sample if they met the criteria for "confirmed", "probable", or "suspect" according to our proposed case definition. Medical chart abstractors reviewed each chart before deciding if it would be included in the analytic sample.

Methods

We reviewed the EHRs and assessed symptom presentation and other indicators to determine whether each visit met the suspect case criteria. For visits classified as suspect cases, we entered all relevant data into a chart abstraction tool to capture data from medical records (**Appendix N**). The abstraction tool was created in REDCap to capture de-identified data on symptoms, medications, treatments, clinical assessments, and outcomes **(Appendix O).** This tool was modeled after a similar tool used by the Chicago Department of Health and tailored to meet the needs of this project with the support of subject matter experts.

Most chart abstractions were completed in Cecil County. In Baltimore city, we had the opportunity to abstract additional medical charts suspected to be medetomidine-related. Unlike the patient encounters in Cecil County, the Baltimore City charts were distinctive in that some visits document care from the onset of substance use through to the resolution of withdrawal. Providers in Facility B identified 10 visits for abstraction, corresponding to four unique patients. However, no charts from the overdose spike event on July 10, 2025 were available, as patients were transferred to various hospitals without follow-up and medetomidine was not implicated.

Data from the chart abstraction process were exported from RedCAP and imported into R statistical software for cleaning and analysis. Patient charts were included if the patients were 18 years or older and met the case criteria for confirmed, probable or suspect medetomidine withdrawal syndrome. Descriptive statistics were calculated for the included patient charts. Patients with more than one visit may be represented in the analysis. We developed the abstraction tool to collect known signs, symptoms, and treatments, in addition to having a free-text field to document additional information not captured elsewhere, such patient summaries, newly identified or common slang terms.

RESULTS

Using our criteria for medical chart selection, we identified 120 visits with opioid withdrawal as the discharge diagnosis in Cecil County and Baltimore City. Due to the absence of confirmatory testing, we were only able to classify all cases as either non-cases or suspect cases. Of the 120 visits, 90 met the suspect case definition. These visits corresponded with 71 unique patients, as some individuals had multiple visits.

We looked at the distribution of suspected cases over time by morbidity and mortality weekly report (MMWR) week to investigate any temporal patterns. **Figure 6.1** shows the number of visits in the period from March to April 2025 by week. The number of suspect cases ranged between 6 and 12 per week, with an average of 8 cases.

1. Demographics

Most patients identified as White and non-Hispanic, with a median age of 40 years (**Table 6.2**). Seventy-three percent of patients were insured through Medicaid. Notably, 38% of patients had at least one instance of self-directed discharge. Ten percent of patients had one type of drug use history documented, while 90% had more than one. Among those who reported more than one type of drug use history, 84% had 2–4 types of drug use history and 15% had five or more. Fentanyl was the most commonly used prior substance, followed by tobacco and heroin. Of the visits analyzed, 63% resulted in hospital admission, and

58% began with patient transport by ambulance. Additionally, 64% of visits involved patients who were either initiated on or continued with MOUD.

2. Signs and symptoms

We assessed the presentation of signs and symptoms among the included medical visits. The commonly observed signs and symptoms of medetomidine-related withdrawal included one or more of the following:

- nausea
- vomiting
- tachycardia
- tremors
- hypertension
- hypokalemia
- leukocytosis

3. Pharmacotherapies

We also captured treatments used to care for patients in the included visits. Providers managing medetomidine-related withdrawal symptoms commonly used one or a combination of the following pharmacotherapies depending on patient presentation:

- ondansetron
- hydromorphone
- clonidine
- gabapentin
- dexmedetomidine
- benzodiazepines

Figure 6.1. Number of visits for suspect medetomidine-related withdrawal syndrome by MMWR week of admission, March & April 2025, Facility A

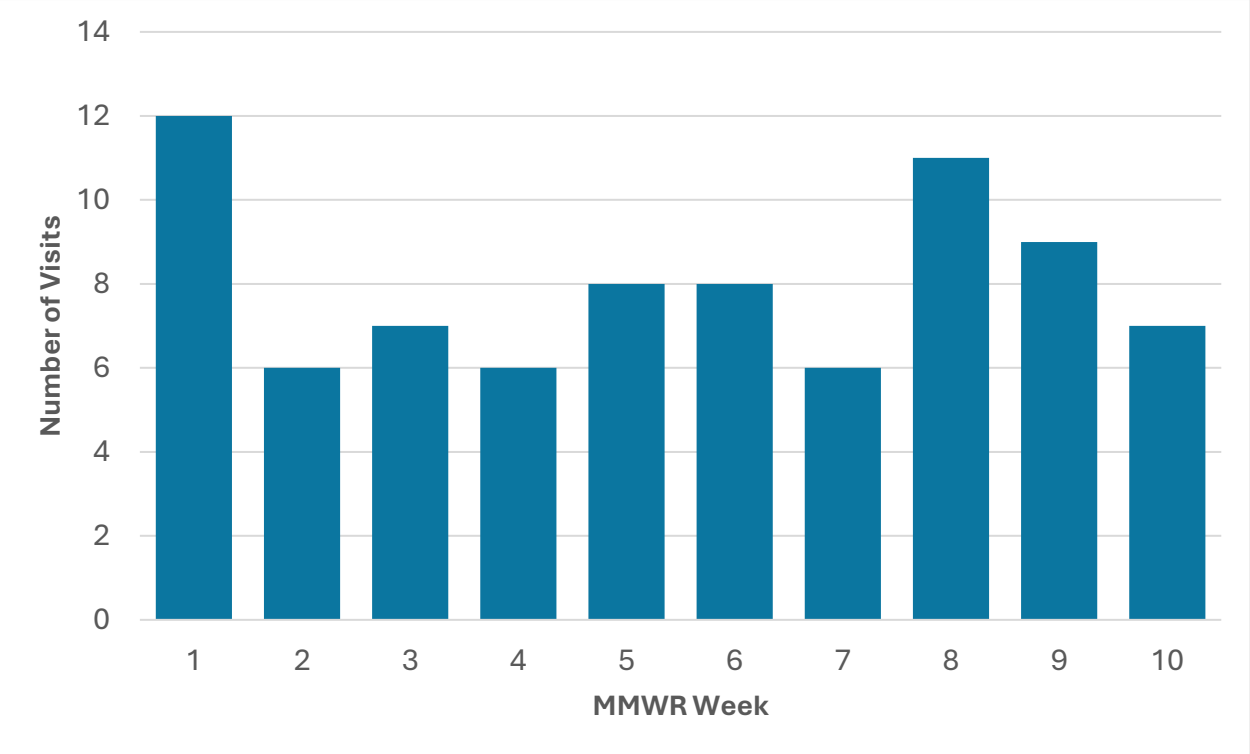


Table 6.2. Descriptive statistics for suspect cases of medetomidine-related withdrawal syndrome by unique patient (n=71)

Characteristic	N (%) or Mean (SD)
Age	40 (7.6)
Sex	
Male	40 (56.3)
Female	31 (43.7)
Marital Status	
Single	45 (63.4)
Married	15 (21.1)
Divorced, Widowed or Unknown	11 (15.5)
Employment Status	
Unemployed	51 (71.8)
Employed, Person with Disability or Unknown	20 (28.2)
Health Insurance	
Medicaid/Medicare	52 (73.2)
Private, Other or Unknown	19 (36.5)
Prior Substance Use History[10]	
One to two	24 (33.8)
Three	22 (31.0)
Four	15 (21.1)
Five or more	10 (14.1)
Prior Substance Use History by Type[11]	
Fentanyl	63 (88.7)
Tobacco	51 (71.8)
Heroin	33 (46.5)
Other[12]	27 (38.0)
Alcohol	14 (19.7)
Benzodiazepines	13 (18.3)
Cannabis	11 (15.5)
Cocaine	11 (15.5)
Previous Prescription of MOUD	43 (47.8)

DISCUSSION

Despite efforts to characterize medetomidine-related withdrawal syndrome, we were limited by the absence of confirmatory toxicology testing to ensure that the patients had medetomidine in their systems. Patients with suspected medetomidine-related withdrawal presented similarly to those exposed to other sedative adulterants recently in the drug supply, such as xylazine. Many patients in this population had multiple comorbidities and were generally unwell, making it difficult to distinguish symptoms attributable to medetomidine exposure or withdrawal from underlying conditions or other substances. Additionally, symptoms of medetomidine withdrawal syndrome were not atypical of opioid withdrawal, making it

[10] Categories reflect the number of documented substance types used and do not indicate whether use was concurrent or sequential.
[11] Substance types are not mutually exclusive and reflect documented substances; patients may have more than one type of drug use history. Percentage do not sum to 100% and use may have been concurrent or sequential.
[12] Includes cannabinoids, and other opioids, sedatives or stimulants not otherwise specified.

challenging to parse patients specifically with medetomidine exposure. These findings were consistent with qualitative interviews with providers and PARO, who described presentations resembling typical opioid withdrawal but with greater severity. Notably, symptom severity was difficult to fully capture in chart documentation, suggesting that medetomidine may be contributing to more clinically severe withdrawal presentations than standard records reflect.

Treatment patterns reflected this uncertainty. In absence of confirmatory testing, providers relied on clinical presentation and treated opioid withdrawal and individual symptoms empirically. Based on prior literature, we sought to capture the use of dexmedetomidine and hydromorphone for treatment. Chart abstraction captured use of medications, including clonidine, hydromorphone, gabapentin, and dexmedetomidine, though dosing, frequency, and timing were not well-captured. Future studies are needed to establish best practices for medication administration and titration in high-risk, polysubstance withdrawal presentations.

Although not systemically captured in the abstraction tool, review of provider health care notes indicated increasing involvement of PRS in supporting patient engagement and linkage to care during these visits over the study period. This was consistent with qualitative findings highlighting PRS as critical partners in addressing severe withdrawal and facilitating continuity of care. These notes also provided additional insight into patient disposition and drug use practices.

Finally, the data from the Baltimore City charts, supported by expanded toxicology testing, may further clarify characterization of medetomidine-related withdrawal and inform optimal treatment strategies from an addiction medicine lens. Differences in chart selection methodology between Baltimore City and Cecil County should be considered when interpreting comparisons.

RECOMMENDATIONS

1. Strengthen data triangulation

Clinical surveillance may be of limited use without triangulation with other data sources, such as confirmatory toxicology testing, syndromic surveillance or drug-checking data (e.g., RAD). We recommend using other sources to support the data from chart abstraction, improving interpretation and strengthening situational awareness overall.

2. Improve characterization of medetomidine exposure and withdrawal

Expand use of confirmatory toxicology testing to better characterize medetomidine exposure and withdrawal syndrome, supporting more precise clinical guidance and surveillance.

3. Establish clinician workgroups and strengthen cross-jurisdictional clinician collaboration

Form clinician workgroups to develop and disseminate best practices for managing complex opioid and polysubstance withdrawal, including medication titration and stabilization strategies for high-risk patients. **Syndromic surveillance findings demonstrated that patients frequently seek care outside their home jurisdictions, highlighting the need for stronger clinical ties, particularly between smaller rural hospitals and larger urban centers.**

Structured forums for cross-jurisdictional collaboration may need to be established to support case consultation, shared learning, and coordinated response to emerging substances. Leverage existing resources such as MACS to facilitate routine multidisciplinary and peer-to-peer collaboration. Strengthened clinician engagement will improve care consistency, enhance linkage to care across systems and support rapid adaptation to evolving drug trends.

LIMITATIONS

Clinical presentations of medetomidine-related withdrawal overlapped with opioid and other sedative withdrawal syndromes, and confirmatory toxicology testing was not performed. Additionally, many patients had existing comorbidities, limiting the ability to attribute symptoms specifically to medetomidine exposure. Treatment data were also constrained, as detailed information on medication dosing and titration was not captured. Additionally, differences in chart selection methods may limit comparability and completeness of findings.

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Appendix A. Opioid and Psychoactive Substance Withdrawal Syndromic Surveillance Text Query v1.5

Drafted ESSENCE Syntax

^med[a-z]tom[a-z]din^,OR,^precedex^,OR,^dexdor^,OR,^F11[129]3^,
OR,^F19[129]3^,OR,(,(,(,^agitat^,OR,^aggitat^,OR,^anxi^,OR,^hypertens^,OR,^tachy^,OR,^tremor^,OR
,^vomit^,OR,^with
draw^,OR,^withdra^,OR,^deto[xsz]^,OR,^dtox^,),AND,(,^T40[012346][X0129][14]A^,OR,^F11[129]2^,),),
ANDNOT,(,^F10[129]3[0129]^,OR,^F12[129]3 ^,OR,^deny withdra^,OR,^deny with dra^,OR,^deny
deto[xsz]^,OR,^denies withdra^,OR,^denies with dra^,OR,^denies deto[xsz]^,OR,(,(,^
alc[ho]^,OR,alc[ho]^,OR,^alcohol^,OR,!eoth!,OR,^benzo^,OR,
!B[ZD][ZD]!,OR,!BZ!,OR,!ativan!,OR,^[ck]lon[iao]pin^,OR,^
xan^,OR,xan^,OR,Xan^,OR,^[zx]an[oae]x^,OR,!meth!,OR,^methamphetamine^,OR,^nic[a-z]t[a-
z]n^,OR,^marijuana^,),AND,(,^withdra^,OR,^with dra^,OR,^deto[xsz]^,OR,^assess^,),),),)

Query Parameters within NSSP ESSENCE Query Portal

- **Data Source: Facility Location (full details)**
  - **Site: Maryland** *(pulls all visits seen at MD facilities)*
- **"Has been Emergency= Yes"** *(scroll to find under "Available Query fields")*
- **The saved query (v1.5) will scan the CCDDParsed field.**
- **If you make updates to the query or wish to use free text query fields, please do so under the "CC and DD Parsed Free Text" field** *(scroll to find under "Available Query fields" → under "Diagnosis and ICD Mappings" section. Note: be sure to use the version that says "Parsed")*

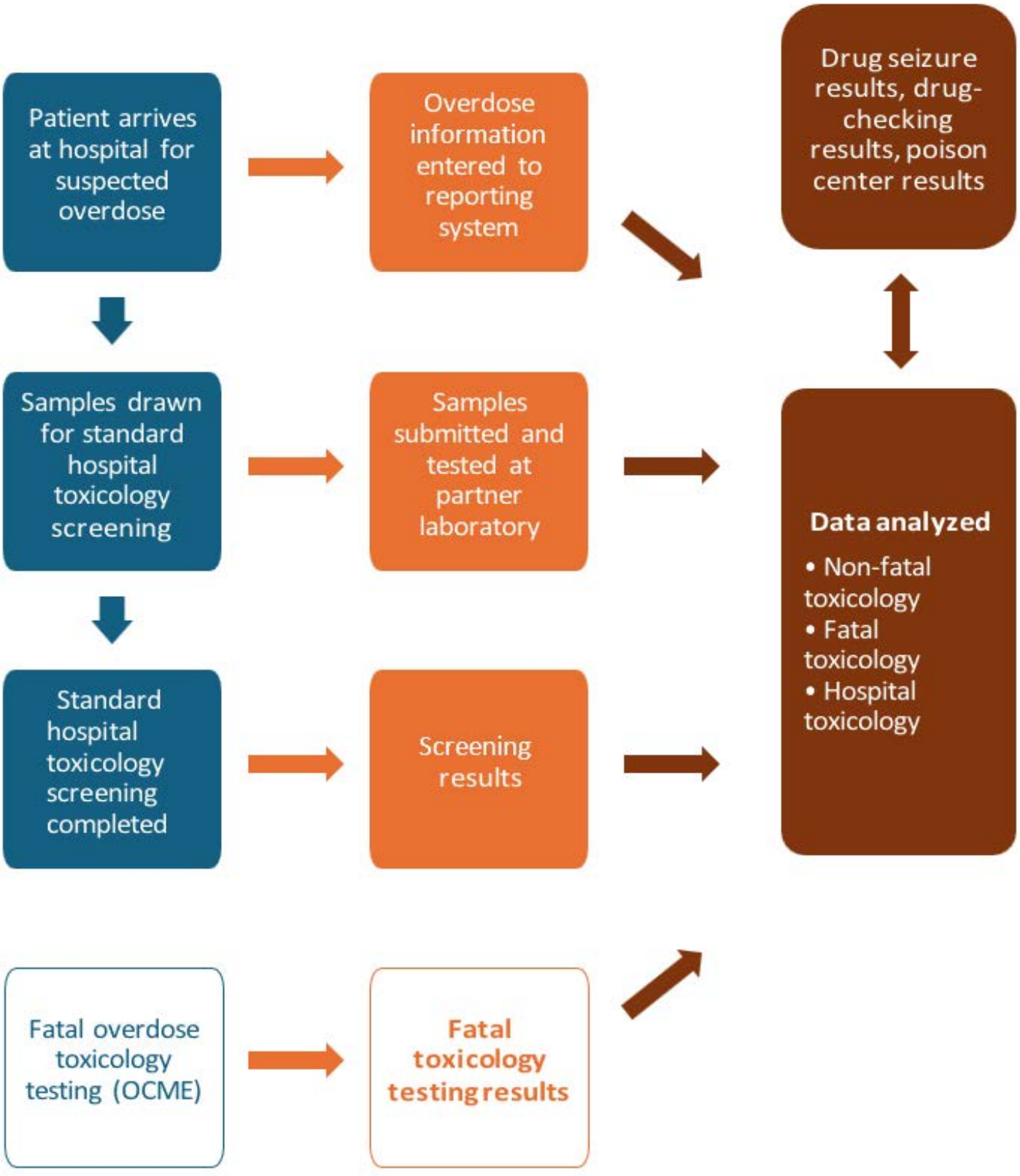
Components of Drafted Query

Variable Type	Automatic Inclusion?	Terms	Description (diagnosis codes only)
Inclusions			
Discharge Diagnosis Codes			
ICD-10-CM **opioid-**related **withdrawal** codes	Yes	F11.13 F11.23 F11.93	Opioid abuse, dependence, or use, unspecified, with withdrawal
ICD-10-CM **other psychoactive substance**-related **withdrawal** codes	Yes	F19.13 F19.23 F19.93	Other psychoactive substance abuse, dependence, or use, unspecified, with withdrawal
ICD-10-CM **opioid poisoning** codes	Conditional, only **IF** a CC term for withdrawal/detox *or* withdrawal-related symptom is also present **AND** no exclusion terms	T40.1X1A T40.1X4A T40.0X1A T40.0X4A T40.2X1A T40.2X4A T40.3X1A	Poisoning by *heroin, opium, other opioids, methadone, other synthetic narcotics, fentanyl or fentanyl analogs, tramadol, other*

		T40.3X4A T40.4X1A T40.4X4A T40.411A T40.414A T40.421A T40.424A T40.491A T40.494A T40.601A T40.604A T40.691A T40.694A	*synthetic narcotics, unspecified narcotics,* ***or*** *other narcotics,* accidental (unintentional) **or** undetermined intent, initial encounter
Opioid use/abuse/dependence codes with intoxication (but NO withdrawal)	Conditional, only **IF** a CC term for withdrawal/detox *or* withdrawal-related symptom is also present **AND** no exclusion terms	F11.12 F11.22 F11.92	Opioid abuse, dependence, or use, unspecified, with intoxication
Chief Complaint Terms			
Medetomidine (and misspellings)	Yes	med[a-z]tom[a-z]din	
Dexmedetomidine terms	Yes	Precedex, dexdor	
Withdrawal or detoxification	Conditional, only **IF** T40 code for opioid overdose **OR** F11 code for opioid use/abuse/dependence with intoxication is present **AND** no exclusion terms	Withdra, with draw, deto[xsz], dtox	
Withdrawal-related **symptoms**	Conditional, only **IF** T40 code for opioid overdose **OR** F11 code for opioid use/abuse/dependence with intoxication is present **AND** no exclusion terms	Agitat, aggitat, anxi, hypertens, tachy, tremor, vomit	
Exclusions			
Discharge Diagnosis Codes			
ICD-10-CM alcohol withdrawal codes	Exclude if record was not captured by an auto-inclusion CC or DD term	F10.130, F10.131, F10.132, F10.139 F10.230, F10.231, F10.232, F10.239 F10.930, F10.931, F10.932, F10.939	Alcohol abuse, dependence, or use, unspecified, with withdrawal, uncomplicated; withdrawal delirium; withdrawal with perceptual

			disturbance; withdrawal, unspecified
ICD-10-CM cannabis withdrawal codes	Exclude if record was not captured by an auto-inclusion CC or DD term	F12.13, F12.23 F12.93	Cannabis abuse, dependence, or use, unspecified, with intoxication, with withdrawal
Chief Complaint Terms			
Denies withdrawal or detoxification	Exclude if record was not captured by an auto-inclusion CC or DD term	Deny withdra, deny with dra, deny deto[xsz], denies withdra, denies with dra, denies deto[xsz]	
Alcohol, nicotine, methamphetamine, benzodiazepine, or marijuana withdrawal, detoxification, or assessment	Exclude if record was not captured by an auto-inclusion CC or DD term	Alc, alcohol, etoh, nic[a-z]t[a-z]n, benzo, B[ZD][ZD], BZ, Ativan, [ck]lon[iao]pin, Xan, [zx]an[oae]x, meth, methamphetamine, or marijuana AND Withdra, with dra, deto[xsz], or assess	

Appendix B. Biosurveillance Process



Appendix C. Medetomidine-related Key Informant Interviews

1) Would you tell us about your position and what your work entails?
    a) How has your role changed?
2) Would you tell us about the trends in overdoses observed in Cecil County?
3) What do you hope comes out of the response work in Cecil County?
4) Where do PARO go to access services?
5) What organizations or persons should we reach out to for service provider interviews?
6) Is there anything else that would be useful for us to know that we haven't covered?
7) What is the best way to contact you while we are in the field?

Appendix D. Medetomidine-related Interview Protocol

Qualitative Assessment of Overdose Response Activities and Withdrawal Management involving Emerging Drugs in the Northeast Region of Maryland: Protocol

BACKGROUND & GOALS

Cecil County, Maryland, located in the northeastern corner of the state and bordering Pennsylvania and Delaware, has been facing a severe opioid overdose crisis. According to the 2022 Cecil County Community Health Needs Assessment, drug poisoning deaths per capita are significantly higher in Cecil County compared to the U.S. average, with an age-adjusted rate of 74.1 per 100,000 population, starkly surpassing Maryland's rate of 39.4 and the national rate of 24.0. The county's overdose death rate more than doubled between 2016 and 2020. In March and April 2025, the existing crisis was compounded by a further spike in both nonfatal and non-fatal opioid-related overdoses. Drug paraphernalia testing programs revealed a concurrent increase of sedative adulterants in the local opioid drug supply, most notably medetomidine. Anecdotal evidence from clinicians and other providers serving people at risk of overdose, also indicated an increase in cases consistent with acute overdoses involving opioids with sedative adulterants and medetomidine withdrawal syndrome.

Cecil County offers a range of substance use treatment and overdose resources, including recovery groups, residential treatment, intensive outpatient treatment with MOUD, and hospital care. The county has two Federally Qualified Health Centers providing primary, mental, and dental care, though it is designated as a shortage area for mental health professionals. Maryland's Office of Overdose Response collaborates with local jurisdictions, including Cecil County, to implement overdose prevention programs and maintain an Overdose Prevention Team. Additional resources include naloxone training and fentanyl test strips.

Maryland Department of Health (MDH) has requested assistance conducting a qualitative assessment to inform improvements to current clinical and community-based service delivery related to substance use and overdose response activities, including acute overdose and withdrawal management.

AIMS FOR QUALITATIVE ASSESSMENT

Using in-depth interviews with (1) people in Cecil County who report illicit opioid use and (2) providers serving PARO in Cecil County, this qualitative assessment aims to:

- Understand the individual and structural factors contributing to the increase in opioid-related fatal and non-fatal overdoses in Northeast Maryland during March and April 2025
- Describe barriers and facilitators to overdose prevention and substance use treatment services
- Identify strengths and weaknesses of the current service landscape
- Explore experiences managing and receiving treatment for (1) acute opioid overdoses involving sedative adulterants and (2) medetomidine withdrawal syndrome

DATA COLLECTION

Recruitment

Service provider recruitment

We will conduct in-depth, semi-structured individual and/or group interviews with local (1) providers with experience in substance use treatment and/or overdose management, (2) first responders with experience in initial overdose response, and (3) community programs serving people who used drugs (e.g., opioid associated disease prevention providers, outreach and advocacy organizations). We plan to conduct 5 to

10 group interviews and an additional 5 to 10 individual interviews. MDH has organized and prescheduled with key groups of service providers (See table below). To ensure we interview a diverse array of service providers, additional providers will be purposively sampled and recruited for individual interviews in coordination with MDH and the Cecil County Overdose Prevention Team, as well as through participant referral. The sample of service providers may include leadership/program managers, ED/ICU clinicians, substance use treatment providers, primary care providers, paramedics, EMTs, firefighters, police officers, case managers, patient navigators, peer counselors, outreach staff, CBO staff, health department staff, and others as recommended by participants.

Prescheduled Provider Group Interviews

Type of Service Provider
ED Providers
ICU Providers
Outpatient Substance Use Treatment Providers
Primary Care Providers
Peer Navigators
Opioid Associated Disease Prevention and Outreach Program Staff
EMS Providers

Community member recruitment

We will conduct in-depth, semi-structured group and/or individual interviews with community members who use drugs. To capture a wide cross-section of experiences from people at risk of overdose, we will employ multiple sampling and recruitment methods. We will also use location-based targeted convenience sampling at venues that provide services to people at risk of overdose. Additionally, street recruitment will be conducted in neighborhoods known to have a high concentration of PARO or overdose events/fatalities. We will work with MDH and their community partners to purposively recruit people with experience using drugs with sedative adulterants and/or who have experienced a recent overdose. Finally, we will use additional peer referrals to recruit people from the larger network.

Eligibility criteria for recruitment of interview participants include:

- At least 18 years old;
- Self-reported use of illicit opioids on or after March 1, 2025;
- Is able to complete the interview in English;
- Is a current resident of Cecil County, Maryland or individual with connections to Cecil County including receiving substance use-related services in the area;
- Able to provide informed consent.

Participants will primarily be recruited from various settings using location based targeted convenience sampling. These settings include opioid associated disease prevention and outreach programs (both stationary and mobile), overdose prevention programs, and addiction treatment centers. In these service provider settings, staff will be informed about the objectives, methods, and eligibility criteria for participation. Staff will also preschedule 3 to 5 interviews with eligible participants. Other prospective participants will be referred immediately for eligibility screening and interview (if interviewer and notetaker are present at location) or will be provided with an information flyer and interviewer contact to schedule an interview.

Street recruitment will take place in neighborhoods with high concentrations of PARO or frequent overdose incidents and fatalities. Investigation staff, accompanied by overdose prevention service outreach staff known to the community, will approach potential participants, providing them with details about the investigation. Those interested will be taken to the nearest interview site for eligibility screening and interview. If immediate participation is not possible, an appointment will be scheduled at a more convenient time.

We will also perform additional purposive sampling using referrals from services providers affiliated with MDH and/or the Cecil County Overdose Prevention Team. Providers who are asked to make interview referrals will be informed about the qualitative assessment objectives, methods, and eligibility criteria for participation and will be provided with interviewer contact information to refer potential participants. Participants identified through peer recruitment will be contacted by the interview team for initial eligibility screening.

To maximize variation in our sample, we will also work with partners to aim to recruit from the following sub-groups (1) persons who have experienced an overdose resulting from illicit opioids including medetomidine since March 1st 2025; (2) persons who have experienced withdrawal from illicit opioids and medetomidine since March 1st 2025; and (3) persons who report differing methods of administration (i.e. injection, inhalation, smoking, etc.) of illicit opioids since March 1st 2025. We will recruit and interview until saturation is reached or all incentives have been distributed (up to 15 persons with lunch provided).

Prior to the start of the interview, the participant will receive detailed written information about the interview and their rights as a project participant. This same information will also be read aloud and consent obtained verbally. Participants who agree to participate will then begin the interview.

Interviews

For service provider interviews, we will use interview guides to conduct in-depth, semi-structured individual and/or group interviews. We will ask participants about the disproportionate baseline rate of opioid overdoses in Cecil County, the increase in opioid-related overdoses during March and April 2025, service provider offerings and overdose prevention strategies, and perceived facilitators and barriers to accessing substance use-related services, such as discrimination and negative attitudes and beliefs towards PWDU. Clinicians will also be asked about their experiences managing acute managing acute opioid overdoses involving sedative adulterants and medetomidine withdrawal syndrome, including challenges related to clinical presentation and social complexity often experienced by people experiencing these conditions.

For interviews with community members who use drugs, we will use a semi-structured interview guide to conduct in-depth interviews with up to 15 participants. Brief demographic data will be collected. Interviews with community members will cover a comprehensive range of topics, including their thoughts and beliefs regarding opioid-related overdoses in Cecil County and how perceptions of overdose risk have changed during the March/April timeframe. Discussions will explore what they believe is contributing to the outbreak and what measures can be taken to address and prevent future outbreaks. The interviews will also examine recent changes in drug use behaviors, withdrawal experiences, withdrawal response tactics, and the natural history and physical signs of opioid overdoses. Additionally, the conversations will delve firsthand experiences with opioid overdose and medetomidine withdrawal, both witnessed and personally experienced; needs and use of overdose prevention services; barriers to accessing overdose prevention and substance use-related services; and preferences for risk communication about outbreaks and medetomidine-involved overdose and withdrawal.

Interviews will be conducted using a team of two with one interviewer asking questions and the second person taking detailed notes. Interviews will be conducted in English. For all participants that provide permission, interviews will be audio recorded by either digital recorder or tablet with recording capabilities.

All recordings will be backed up on a hard drive on a secure computer and subsequently deleted from the original recorder device. If permission for audio recording is not granted, the information will be recorded only through note taking. After the interview, each audio recorded interview will be transcribed and reviewed for completeness and correctness by either the interviewer or notetaker who participated in the interview.

Each interview will take approximately 60 minutes. Participants will be given a participant ID number after successfully completing the eligibility screener. Each community participant will be compensated with lunch for the interview. Incentives for community member interview participants will be provided by state or local partners, according to state and local policies and regulations.

After each interview, the note-taker and interviewer will summarize key findings and observations using a structured debrief guide. The qualitative assessment team of interviewers will debrief at the end of each day to compare key findings and identify any emerging issues or topics that may inform revisions to the interview guide.

REFERRALS

Referrals for substance use treatment and/or overdose prevention services will be provided to any participants who express a desire to engage with these services. Other social or healthcare services referrals can be provided to participants if additional needs are identified. All referrals will be discussed with MDH, Voices of Hope, and the interview team to ensure proper linkages and follow-up are provided.

DATA MANAGEMENT AND ANALYSIS

Data security

No personally identifiable information will be included in project documents; only the participant ID numbers will be included. Participant ID numbers will be generated sequentially. In-person interviews will be documented electronically or on paper. All interview notes and audio recordings will be protected by a locked container or secure computers. If paper materials are utilized, hard copy documents will be stored in a secure, locked file cabinet in MDH with restricted entry. All audio recordings on encrypted CDC network drive. Each audio recording will be labeled with the participant ID number. Hard copies will be destroyed when they are no longer needed or after six months, whichever occurs first.

Each audio recorded interview will be transcribed using a HIPPA compliant AI transcription service. Each transcript will be labeled as the participant ID number. The interviewer or notetaker who participated in the interview will then check their respective transcripts for accuracy and make corrections, redact any identifiable names of persons or places, store the transcripts on a secure encrypted thumb drive from MDH and encrypted CDC network drive. Recorded voices of participants can be altered per local policy to further ensure anonymity. Recording will be destroyed 3 months after receipt of transcriptions.

Only authorized staff will have access to the data. Any publication of findings will contain only aggregate data as no identifying information is being solicited or collected.

Preliminary analyses

Analyses will be concurrent with data collection to assess for thematic saturation (where the same themes are recurring, and additional insights are unlikely with more data). Iterative analyses will be conducted daily during end-of-day team debriefs and key findings will be documented in debrief meeting notes. Interviewing teams will enter interview notes into a matrix that captures key findings by interview question for each participant, allowing for rapid comparison across sub-groups of participants.

After data collection is completed, the interviewing team may conduct additional analyses, including a more in-depth thematic content analysis as appropriate. An initial codebook will be developed based on

the interview guides, interview notes, and team debrief notes. Transcripts, debrief meeting notes, and interview notes will be uploaded to a qualitative data management software, such as *MAXQDA,* to aid with analyses.

DATA DISSEMINATION

MDH will retain ownership of data and findings. CDC will disseminate the information through a report back to MDH for local internal use and will collaborate with MDH to share the results with participants, as well as publish reports, manuscripts, and/or presentations if requested.

Appendix E. Facilitated Group Discussion Guide

Objective: The goal of this discussion is to describe the effectiveness of activities initiated by the overdose prevention team, identify lessons learned, and inform future response activities. We will conduct a facilitated discussion to gain insight into the perspectives of health department and community partners.

We're so excited to have the opportunity to hear more from you about your experiences in responding to medetomidine-related overdoses and withdrawal in Cecil County. You're here because we value your insight as active participants in this response. You are the experts on this response, and you can help us learn what has been working and where you've encountered struggles—especially where you think a shift in direction might be needed. By participating in this discussion openly, you can help us translate your knowledge into lessons learned, which may help this response and help other health departments in future as well.

We'll cover the following topics: (1) collaboration, communication, and coordination, (2) medetomidine-related overdoses and withdrawal, and (3) next steps for this response. We would like to remind everyone that this discussion is informal and that we are interested in hearing about *your* experiences related to the response work that Cecil County, the Maryland Department of Health, and other community partners have conducted. Overall, we want to hear about what has been working well with the medetomidine response and whether to continue or shift directions with specific response activities.

We know your time is valuable and you are stretched very thin. Participating in this facilitated discussion is voluntary and will **end by 11:00am** with a 10-minute break in the middle.

What is discussed in this room, stays in this room. While we cannot guarantee that the discussion is confidential, we ask everyone to keep the comments and information shared confidentially within the group.

We will share information out in ways that don't identify anyone, including clients and program staff.

Now, we are going to facilitate separate in-person and online discussions. We will share the findings of both groups in our final report. Those of you online please give Nhia a few minutes to sign on and begin the facilitation

[Break into 2 groups]

Before we begin, can we do brief introductions starting with your name, the organization you work with, and one word that shares how you're feeling about this facilitated discussion (excited, nervous, bored etc.)?

Part 1

First, we will discuss the overall response activities from the beginning of the response through today to understand successes and challenges faced during response activities. I will ask questions about working with other organizations, particularly as they relate to the presence of Medetomidine in the drug supply within Cecil County.

Topic 1: Collaboration, coordination, and communication of response activities
I want the group to discuss collaboration, coordination, and communication of response activities amongst organizations AND with people at risk of overdose and others affected by the outbreak.

Collaboration

1. What has successful collaboration looked like in this response so far?

Potential probes:

- What has facilitated successful collaboration?
- What has been a barrier to collaboration?
- What can we do to break down barriers to collaboration?
- What partnerships were formed? Which already existed and were expanded?

Coordination

2. We have heard that response activities have been coordinated across jurisdictions. What do you think has worked well in terms of response coordination?
    a. Intercounty coordination
    b. Interstate coordination – DE, PA, MD
3. What coordination challenges have you encountered?
4. What elements do you want to continue on an ongoing basis?
5. What elements do you want to have at the ready for another response?

Communication

6. How have you been communicating about Medetomidine-related issues?
    a. What would you like to see more of?
    b. What isn't working?
    c. What are gaps in information or misinformation?
    a. What has communication looked like between the Department of Health and broader community?
    b. What has communication looked like among local organizations?
    c. What has communication looked like with affected population?
        i. What are the main barriers to reaching people who are actively using drugs?
    d. What has communication looked like with providers and organizations outside of Cecil County?

Potential probes:

- What are the communication barriers?
- Why were they a challenge?
- What was successful and why?
- What are gaps in information or misinformation?

[10 MINUTE BREAK]

Topic 2: Medetomidine Response

Now, we will discuss current response activities related to medetomidine, including overdose and withdrawal

1. What methods and approaches were most effective in developing a comprehensive understanding of the impact of medetomidine's presence in the drug supply within Cecil County?
    a. What challenges did your team face in developing an understanding of medetomidine's impact?
    b. How would you mobilize differently in the next response?

1-2-4-All Exercise
Facilitator: We will use an exercise called 1-2-4-all to generate responses to the next discussion question. First, you will start with one minute of time alone to think about ideas, then you will pair up to share your ideas. Next you will be in groups of four, then these groups will share with the whole group. We will keep time and call out when it is time to move to the next step.

Set-up notes: Make sure everyone has pens and small post-it notes or paper to jot down their ideas during the first step of silent reflection. Set up large post-it notes for the groups of four to use (if they like). During the last step (all), facilitator team will capture ideas shared on large post-it notes.

Step one: solo reflection (1 minute)
- On your own, quietly jot down your responses to this question for one minute.

Step two: pairs (2 minutes)
- Pair up with someone next to you.
- Generate ideas in pairs, building on ideas from self-reflection.

Step three: group of four (4 minutes) – provide large post-it notes and markers
- Now, pairs will now join another pair for a group of four.
- Share and develop ideas from your pair in foursomes. Notice similarities and differences.
- Agree on the top three to four ideas to share with the wider group.

Step four: share back to larger group (5 minutes)
- Each group shares one important idea with all (repeat cycle as needed).
- Ask, "What is one idea that stood out in your conversation?"
- We would like each group to share one insight but not to repeat insights already shared.

Virtual Group will do the Menti-meter activity

Up until this point most of our in-depth interviews have been with direct service providers. I think that we have a unique opportunity with so many community leaders here. For the next two questions we really want you to try to focus your responses on systems-level success and challenges.

2. What specific interventions or strategies have been most effective in addressing medetomidine-related overdoses and withdrawals? ***(1-2-4-ALL Breakout)***
    a. Can you provide examples of how these interventions were implemented and the results they achieved?
    b. Have you observed any unintended consequences of these strategies?
    c. How can you build on these successful strategies?

3. What are the barriers your team faces in effectively responding to medetomidine-related overdoses and withdrawals in the community? **(1-2-4-ALL Breakout)**
    a. What specific strategies or interventions have you implemented to overcome these barriers?
    b. Can you share examples of how these strategies have been applied and their effectiveness?
    c. How can your team adapt or modify its current response strategies to better address the identified challenges?
    d. What new approaches or adjustments could enhance your effectiveness in tackling medetomidine-related issues?
    e. What actions can your team take to develop sustainable, long-term solutions to the challenges presented by medetomidine, and potential future adulterants?

PART 2

Lastly, we will now take some time to discuss immediate next steps in the medetomidine response…

1. What specific, concrete actions should be taken now in order to improve response medetomidine-related overdoses and withdrawals?
    a. Who is responsible or can take action on these strategies?
    b. Which untapped organization may help you implement these actions?
    c. How will you measure the effectiveness of these actions?

[CLOSING] Thank you for this great discussion. We have gained great insight into ways to help assist with this outbreak response. As a next step, we will summarize and share what we learn during these discussions with the health department. If you have any questions or concerns in the meantime, please do not hesitate to reach out.

Appendix F. Facilitated Group Discussion Findings

BACKGROUND

A facilitated group discussion was conducted among representatives from multiple sectors, including social services, criminal justice, and mental and behavioral health, who comprised the response team that formed on March 14, 2025. Participants were asked broad questions about their partnership, lessons learned, and future direction (Appendix E). Analysis identified key findings across five areas: collaboration, coordination, communication, feedback on the medetomidine response to date and recommendations.

RESULTS

Collaboration

Participants described a broad and expanding collaborative network focused on staying informed about emerging substances and coordinating response efforts. The group has grown to include state-level experts, nearby jurisdictions (e.g., Delaware, Kent County), healthcare, community-based overdose prevention partners, EMS, and law enforcement, with a shared goal of moving toward a more coordinated statewide response. At the same time, participants also emphasized the importance of broadening participation to include additional partners and sectors that may have been missed. Hospital-based touchpoints—particularly peer programs embedded in the hospital—were identified as critical for responding to high-acuity cases associated with new drugs in the supply. These peer programs also leveraged established relationships and mutual trust with PARO, facilitating bidirectional information sharing that helped corroborate provider observations, overdose trends, and RAD data.

Communication

Effective communication and information sharing were identified as imperative to collaboration and response efforts. Participants emphasized the value of regular data updates, factsheets, and cross-jurisdictional reporting (e.g., Delaware's monthly Street Drug Report), noting that real-time intelligence is essential given that individuals often do not know what substances they are using. Participants proactively raised awareness through social media, flyers, and in-person outreach to both the general public and service providers, leveraging existing networks to disseminate information. While local communication channels were generally responsive, gaps remain in statewide dissemination, particularly in reaching more distal providers due to limited centralized communication pathways. Participants emphasized that local trends, particularly in Cecil County due to its location, may serve as early indicators of broader statewide drug supply shifts and should be communicated more systematically to inform proactive awareness and response across jurisdictions.

Coordination

Coordination across jurisdictions—particularly with Delaware and Pennsylvania—was viewed as essential given shared drug supply routes along the I-95 corridor. These regular meetings and councils were seen as valuable for understanding regional trends and strengthening cross-jurisdictional awareness. At the same time, participants identified persistent challenges, including funding instability for community-based overdose prevention services, housing insecurity, transportation barriers, and limited capacity to meet the needs of people in recovery. Community needs assessments were identified as important tools for guiding mitigation strategies and resource allocation.

Medetomidine response

In response to medetomidine, participants described reliance on a combination of data (RAD, law enforcement), community input, and clinical observation. The local hospital reported significant strain on inpatient and ICU capacity, especially without established protocols at first. Peer support staffing was also

adjusted to meet increased demand, alongside recognition of the need to address judgement, negative attitudes and beliefs about PARO, workforce burnout, and caregiver wellbeing. EMS was identified as another stressed sector, with interest in targeted education and additional frontline support. The challenges have prompted renewed conversations of alternative solutions such as stabilization centers outside the hospital setting for the future.

Needs and recommendations:

- Expand proactive and primary prevention efforts, particularly for women, children, and youth
- Provide continued support for individuals directly and indirectly impacted by overdoses, including witnesses and family members.
- Reduce negative attitudes and beliefs about PARO and strengthen caregiver well-being support for peers and healthcare providers.
- Consider implementing a ride-along program with local law enforcement to enhance support, and cross-sector collaboration.
- Improve access to timely toxicology reporting to inform response efforts.
- Explore development of a stabilization center (approximately 12–14 beds) to reduce strain on hospital capacity during overdose or withdrawal spike events.

Appendix G. Street Intercepts Interview Guide

Qualitative Assessment of Overdose Response Activities and Withdrawal Management involving Emerging Drugs in the Northeast Region of Maryland:

Brief Street Intercept

Hello, my name is _____. We are with here with the Centers for Disease Control and Prevention, working with Voices of Hope and the Maryland Department of Health to better understand the recent increase in opioid-related overdoses in Cecil County.

Everything we discuss will **remain confidential between** you, me, and my colleagues and your answers won't be linked back to you. Also, **my colleagues and I have no ties to law enforcement** and are legally bound to keep your information private. Your name will not be recorded, and you will not be identified personally in any reports or publications.

You can stop me at any time if you have a question or concern. You can skip a question or end the conversation at any time.

So, before we get started, I just want to say **there are no right or wrong answers. I am interested in hearing about your experiences and opinions**. If a question makes you feel uncomfortable, we can skip it.

Location of intercept:	
Time of Intercept:	

1. Have you heard of Medetomidine or "Meda"?
    a. If so, what do you know about it?
    b. From your perspective, how has using opioids changed since you were aware that Medetomidine existed in your community?
2. Have you heard about or experienced any withdrawal symptoms that are different than they used to be six months ago (i.e., the introduction of medetomidine into the drug supply)?
    a. What new or unique signs and symptoms of withdrawal have you observed or experienced?
    b. How has your management of withdrawal symptoms changed in the past six months?
    c. Have you sought or received medical assistance for managing withdrawal in the past six months? If so, describe your experience receiving care for your withdrawal symptoms.
        i. Where did you seek care?
            1. Why did you choose this location?
        ii. What type of treatment did you receive?
        iii. Were you offered referrals to harm reduction?
        iv. Were you offered substance use treatment services?
            1. Did you follow-up? Why or Why not?
        v. Would you seek care at the same clinic or office location again?
            1. Why or why not?
3. In general, how do you think overdoses are different than they used to be six months ago (i.e., before the introduction of medetomidine into the drug supply)?

a. How long between opioid administration and overdose?
    i. When overdosing, did you or your friends “fall out” right away, perhaps with the spike still in their arm and the tourniquet on?
    ii. Or did it happen well after you or they injected?
b. What new or unique signs and symptoms of an overdose have you observed or experienced?
c. How has overdose response changed in the past few months?
    i. Naloxone amount/effectiveness
d. Rescue breathing

4. [If person mentions using opioids] How has your experience of using opioids changed in the last 6 months (i.e., the introduction of medetomidine into the drug supply)?
    a. What do you expect to feel when you use opioids?
    b. Does your current use of opioids available to you feel similar to the opioids you’re used to?
        i. If not, can you describe how the feeling differs?
            1. Do the highs feel different than they used to?
            2. How long does your high typically last?
            3. How long do you typically go between uses?
            4. What unexpected effects have you experienced? (e.g. Memory Loss, Waking up in unknown locations, etc.)
    c. What strategies have you used to keep yourself safe from overdose since you have become aware of Medetomidine in the drug supply?
        ii. Tester shots?
        iii. Using with other people?
        iv. Avoiding mixing drugs?
        v. Going slowly?
        vi. Testing your supply?
        vii. Other ways not mentioned?
    d. How do you believe the usefulness of these strategies might have changed over the last six months?
5. Do you know anyone who have visited the ED or been hospitalized for an overdose or withdrawals in the past six months who may be willing to speak with us?

Appendix H. Street Intercepts Results

BACKGROUND

Street intercept surveys are a rapid method for collecting data at the point of recruitment by approaching individuals in public settings to administer brief questionnaires. These surveys enable timely data collection from general and hard-to-reach subpopulations. In Cecil County, surveys were conducted in areas with high rates of substance use. Surveys were intentionally brief to yield higher participation and included five core questions with additional probes as needed (Appendix G). These data were not included in the original analysis; interviewees were community members who did not use drugs. They are presented here for additional contextual insight. Analysis of the four completed street intercept interviews identified findings in four areas: medetomidine awareness, withdrawal experiences, overdose recognition and response, and opioid use behaviors.

RESULTS

Medetomidine awareness

Awareness of medetomidine in the local drug supply varied, suggesting uneven dissemination of information. All but one interviewee had heard of medetomidine; however, one referred to it as “tranq” and did not recognize it as the same substance. One interviewee associated it with severe withdrawal symptoms, while two others described general awareness of its presence. One interviewee who self-identified as a mother expressed concern about increasing drug use and related violence in the community.

Withdrawal experiences

All interviewees described withdrawal as more severe than traditional opioid withdrawal, though not necessarily symptomatically different than previously. Reported symptoms included seizures, tremors, increased pain, and more frequent use to avoid withdrawal. One interviewee described a partner requiring ICU-level care and fearing he might die, reinforcing perceptions of severity. Another described being personally more alert, with less hesitation calling for help.

Overdose recognition and response

All but one interviewee described perceived differences in overdose presentation, including increased sedation, reduced responsiveness to naloxone, and abnormal breathing described as "wheezy” or “gurgling”. Reduced naloxone responsiveness was characterized as difficulty arousing individuals who would not wake when stimulated. One interviewee reported witnessing a recent overdose in which multiple naloxone doses were administered, including both intranasal and intramuscular routes. Another described a fatal overdose involving a former partner and subsequent connection to overdose prevention resources but lacked details regarding substance involvement. Overall, interviewees described heightened community vigilance in recognizing and responding to overdoses.

Opioid use behaviors and treatment

None of the interviewees reported personal opioid use and were not asked about changes in use behavior or treatment experiences. However, one interviewee identified barriers to treatment, including transportation challenges, relationship dynamics (e.g., couples navigating recovery at different stages), judgement and negative attitudes and beliefs about PARO in healthcare settings, and limited incentives or support for individuals who discontinue use outside of formal treatment programs. These structural and social barriers were described as influencing access to and engagement in care.

Appendix I. Medetomidine-related Eligibility Screener for PARO

Qualitative Assessment of Overdose Response Activities and Withdrawal Management involving Emerging Drugs in the Northeast Region of Maryland:

Eligibility Screener

To be completed by the notetaker at the beginning of the interview for eligible participants:	
Participant ID ***MDH2024 + CM + [sequential number - 001, 002], e.g.: MDH2024001***	
Interview ID ***CM + [2 digit month] + [2 digit day] + [first initial of interviewer's first name] + [first initial of interviewer's last name] + [# of interview for the day]***	
Type of Interview	
Date of interview	
Site of interview	
Lead Interviewer name	
Notetaker name	
Agreed to the interview?	Yes No (underline) Witness Initials:
Agreed to the audio recording?	Yes No (underline) Witness Initials:

ELIGIBILITY

1. What county do you spend most of you time in?

   Cecil Other:_____

2. What count(ies) do you receive health-related services in? (e.g., hospital visits, OADPOP visits, primary care visits, etc.)

   Cecil Other:_____

4. How old are you (in years)? _____

5. What is your primary language? _____

6. When was the last time you used heroin, fentanyl, or another illicit opioid? _____

BACKGROUND CHARACTERISTICS

7. What is your sex? Male Female

8. What is your race/ethnicity? (read options and circle all that apply)

   American Indian or Alaska Native Asian Black or African American

   Native Hawaiian/Other Pacific Islander Hispanic, Latino, or Spanish origin

   White Some Other Race; specify _____ Refused

8. Do you have health insurance? Yes No

   8 a. [If yes] What type of health insurance do you currently have?

   Private Medicare Medicaid None (self-pay) Unknown Other_____

9. How long have you been using opioids?_____

10. When using opioids, what is your typical mode of administration? [Select all that apply]

    Inject Inhale Smoke Ingest Other

11. Have you experienced an opioid-related overdose in 2025? Yes No Refuse

    11a. [If yes] Did it occur within the last month? Yes No Refuse

    11 b. [If yes] Did it occur within the 3 months? Yes No Refuse

    11 c. [If yes] Did it occur within the 6 months? Yes No Refuse

12. Are you currently receiving services to help you stop using heroin, fentanyl, or other illicit opioids?

    Yes No

Appendix J. Medetomidine-related Service Provider Interview Guide

Qualitative Assessment of Overdose Response Activities and Withdrawal Management involving Emerging Drugs in the Northeast Region of Maryland:

Service Provider Interview Guide

To be completed by the interviewer at the beginning of the interview for eligible participants:		
Interview ID ***SP + [2 digit month] + [2 digit day] + [first initial of interviewer's first name] + [first initial of interviewer's last name] + [# of interview for the day]***		
Service Provider ID ***MDH2024 + SP + [sequential number - 001, 002], e.g.: MDH2024001***		
Date of interview		
Site of interview		
Lead Interviewer name		
Notetaker name		
Agreed to the interview?	Yes No (underline) Witness Initials:	
Agreed to the audio recording?	Yes No (underline) Witness Initials:	
Interviewee information	**Occupation Specialty**	**Years worked in specialty**
Participant #1		
Participant #2 (if applicable)		
Participant #3 (if applicable)		
Participant #4 (if applicable)		
Participant #5 (if applicable)		
Interviewer Post-Interview Comments and Observations:		

INTRODUCTION

Hello, [*Name/Names*]. Thank you for taking the time speak with me today! My name is [*Insert name*]. I am/we are here with the Centers for Disease Control and Prevention, working with the Maryland Department of Health to better understand current clinical and community-based service delivery related to substance use and overdose in Maryland, including acute overdose and withdrawal management.

[Interviewer, notetakers, and any others to introduce themselves.] Possible language: To provide a bit of background about us specifically we would like to introduce ourselves. My name is _____ and I work as an _____ at CDC. I will be (conducting/taking notes during) today's interview. I've spent much of my career working with (providers, community members, etc, other relevant background). I'll turn it over to my colleague… [Next person provides the introduction].

Purpose: The Maryland Department of Health is looking into a recent increase in both fatal and non-fatal overdoses in Maryland. At the same time, Maryland Department of Health testing of drug paraphernalia has increasingly detected medetomidine mixed with fentanyl in the area, specifically Cecil County. Medetomidine is not approved for use in humans but is approved for use in animals for sedation. Reports from clinicians and other providers serving people at risk of overdose suggest increasing overdoses involving both opioids and sedatives like medetomidine, as well as an increase in the severity of withdrawal symptoms. We are conducting interviews with providers, such as yourself, to better understand current clinical and community-based service delivery related to substance use and overdose in Maryland, including acute overdose and withdrawal management.

Your experiences and opinions are very important to us. Your participation in this interview will help us understand your experience as a provider serving people in Maryland and help inform recommendations to improve overdose prevention, acute overdose response, and withdrawal management activities and services. We sincerely appreciate your time.

Voluntary: Your decision to be interviewed is voluntary. You can decide to stop this interview at any point without any repercussions or skip any questions you do not want to answer. If you do decide to stop, we will delete the recording, and the information provided during your interview will not be included in our analysis

Confidentiality: The information you share will be combined with information from other interviews we conduct to describe participants as a group. Your name will not be recorded, and you will not be identified personally in any reports or publications. Quotes from this interview may be used to accurately convey your perspective; however, nothing will be shared or published that can identify you.

Before we go on, do you have any questions?

Permission to record: We would like to (audio) record this discussion and take detailed written notes. The purpose of recording the interview is to ensure that we are accurately capturing your thoughts, experiences, and perspectives. These audio recordings will be transcribed using a HIPAA compliant AI transcription application. The recording will be destroyed after we are able to complete our analysis or after six months, whichever occurs first. Are there any questions about the recording?

[*If the participant refuses recording*]. Ok, instead my colleague [*insert name*] will take detailed notes.

[*Begin note taking*]. The interview should take about 1 hour (up to 2 hours for group interviews). We'll start with talking about factors contributing to opioid-related overdoses in Maryland, services available to people at risk of overdose in the community, facilitators and barriers to accessing these services, and recent experiences you have had responding to acute opioid overdoses and managing withdrawal.

If you need to take a break at any time, for any reason, please feel free to do so. We can pause the interview and resume as needed.

Do you have any questions that I can answer before we begin? If it's ok, we will begin recording now.

Begin recording: State your name (interviewer's name), date, and then participant ID

INTERVIEW

1. Tell me about your position here and what your work entails.

Next, we would like to discuss your organization and the services provided…

2. What services does your organization provide?
    a. What services does your organization offer to prevent/respond to overdose?
        i. When did your organization begin offering these services?
        ii. Why were these services introduced?
    b. What services does your organization offer to treat/manage substance use disorders?
        i. When did your organization begin offering these services?
    c. Why were these services introduced?

3. How do you typically connect with potential clients who may need your services?

4. Can you describe the intake/enrollment process for clients interested in accessing services?

5. What are barriers to accessing substance use-related services in Baltimore city/Maryland?
    a. What are the barriers to accessing overdose prevention services?
    b. What are the barriers to accessing substance use treatment services?
    c. How have these barriers changed in that past 6 months?

6. How does your organization address barriers to accessing services?

7. What could be done differently to help clients overcome access barriers?

I would now like to discuss opioid-related overdoses in Baltimore city/Maryland…

8. What trends have you noticed in opioid-related overdoses
    a. If you have observed an increase in the number of opioid-related overdoses, why do you think this is?
    b. What data sources do you use to stay informed about overdose trends?
    c. What data sources to you use to understand changes in the drug supply?

d. If applicable, how have you changed your approach to overdose prevention and response?
e. If applicable, how have you changed your response to client withdrawals in the past 6 months?

Now, we would like to transition to a specific discussion about medetomidine …

9. Do you believe you have seen people who have used medetomidine seeking services from your organization/hospital/practice?
    a. If so, how confident that you are caring for someone who has used medetomidine?
    b. If so, please describe your experience seeing people who have used medetomidine.
    c. Have you observed any demographic differences among people using medetomidine compared to people who are not using medetomidine?
        i. If so, what are the differences you have encountered?
    d. How often are you seeing people/patients who you think have been exposed to medetomidine?
        i. Per week?
        ii. Per month?
        iii. What brings most of the patients using medetomidine to your organization/hospital?

10. How has the presence of medetomidine in the illicit drug supply changed your approach to overdose prevention?
    a. Has your organization changed how it counsels clients about the drug supply and drug checking? If so, how?
    b. What risk reductions strategies are you recommending related to medetomidine?
    c. Based on your experience, which strategies are the most successful for preventing medetomidine-involved overdoses?
11. In your experience, how has the presence of medetomidine in the illicit drug supply changed the way opioid overdoses present?
    a. Has it changed how you treat/manage overdoses? If so, how?
    b. Please describe any unique challenges you have observed (hypoxia, naloxone dosing, precipitated withdrawal from multiple naloxone doses administered, rescue breathing).
    c. Based on your experience, can you share any successful strategies for responding to medetomidine-involved overdoses?

12. How has the presence of medetomidine in the illicit drug supply changed the way you clinically manage opioid withdrawal?
    a. Please describe any unique challenges you have experienced in managing withdrawal.
    b. Can you share any successful strategies for managing opioid withdrawal when medetomidine is suspected to be present?
        i. Have there been any medication -related strategies that have been helpful?
        ii. Have there been any behavioral-related strategies that have been helpful?

iii. Other strategies not touched on that you have found helpful?

c. What are your experiences initiating medication treatment for opioid use disorder – such as buprenorphine, methadone, or naltrexone – in the context of medetomidine?
    i. Are there any specific challenges you have encountered? (Precipitated withdrawal, higher dose needed?)
    ii. Has medetomidine affected access to treatment?
    iii. Has medetomidine affected client retention in treatment?
    iv. Has medetomidine affected client willingness to engage in treatment?

13. Do you have access to all the supplies and resources you need to (1) help people at risk of overdose prevent overdose and (2) treat patients presenting with overdose or withdrawal related to medetomidine?
    a. If no, what are you lacking?
    b. What supplies or resources have you been utilizing the most?
    c. Have there been any "new" supplies or resources that have been helpful?

14. Is there anything else related to your experience with medetomidine that you would like to share with us?

CONCLUSION

Thank you for taking the time to share with us today. Those are all the questions I have for you.

- Is there anything else that we need to understand that we didn't touch on today?
- Is there anything else you'd like to add to our discussion before we end?

Ok, thank you. I'm going to [end our recording/stop taking notes] now [*End recording and note-taking*].

[*Share any additional information about dissemination of results/products*]

Appendix K. Medetomidine-related PARO Interview Guide

Qualitative Assessment of Overdose Response Activities and Withdrawal Management involving Emerging Drugs in the Northeast Region of Maryland:

Community Member Interview Guide

INTRODUCTION

Hello, my name is _____. And this is _____. We are with here with the Centers for Disease Control and Prevention, working with the Maryland Department of Health to better understand the recent increase in opioid-related overdoses in Cecil County. We are keeping this conversation confidential; you do not need to share your name with us. My colleague here will be taking notes while we talk. No personal information, such as your name, will be written down or recorded.

The Maryland Department of Health is very interested in understanding your experiences to **help improve overdose prevention and response services, as well as care for people experiencing opioid-related withdrawal symptoms.**

[If participant is hesitant] As a reminder, we will not be asking for your name. No personal information will be collected or linked to you.

Everything we discuss will **remain confidential between** you, me, and my colleagues and your answers won't be linked back to you. Also, **my colleagues and I have no ties to law enforcement** and are legally bound to keep your information private. Your name will not be recorded, and you will not be identified personally in any reports or publications. Quotes from this interview may be used to accurately convey your perspective; however, nothing will be shared or published that can identify you.

Our conversation will take about **30 minutes to an hour.** To thank you for your time, we will offer you food assistance at the end of the interview. You can stop me at any time if you have a question or concern. You can skip a question or end the conversation at any time.

Does this sound like something you'd be interested in? [Note-taker: document consent to interview]
OBTAIN VERBAL CONSENT HERE: Great! Before I begin, I want to go over a couple of items:

- With **your permission, I would like to audio record** our conversation. Maintaining your privacy is very important to us. I do this to make sure that I capture all the information that you share and so I can listen and not worry about taking exact notes. The recording helps me write my report and is used for that purpose only. These audio recordings will be transcribed using a HIPPA compliant AI transcription application. These applications use AI technology to convert spoken words into written text while ensuring the privacy and security of participant's information according to relevant government regulations. The audio file from this interview will be destroyed within six months. **Again, I will not ask your name at any time**. Is it okay for me to audio record our conversation? And if at any point during our conversation, you would like me to stop recording, please let me know. We will also take notes (in case the recording does not work). [Note-taker: document consent to audio recording]
- **Do you have any questions before we begin**? If you have any questions at any time, please stop me and ask.

So, before we get started, I just want to say **there are no right or wrong answers. I am interested in hearing about your experiences and opinions**. If a question makes you feel uncomfortable, we can skip it.

GO TO Eligibility Screener Questions: First, I will just ask some questions about your age, race and other characteristics as well as questions on your background, including some questions about substance use.

Now, I'm going to start the recording.
[Note to Interviewer: Begin recording and state your name, date and the participant ID number].

INTERVIEW

6. Can you tell me about your experiences with substance use and overdoses in Cecil County.

Next, I would like to discuss your general observations about drug use in Cecil County…

7. Have you noticed any differences in substance use and overdoses in Cecil County over the past six months (i.e., the introduction of medetomidine into the drug supply)?
    a. If so, what kinds of changes have you seen regarding substance use?
    b. If so, what kinds of changes have you seen regarding overdoses?

8. What, if any, other types of changes have you seen in the drug supply?

9. What, if any, changes have you seen in how drugs are used?

10. What types of overdose prevention and substance use disorder programs are available in Cecil County?
    a. What are challenges to accessing these services?

11. What services or programs for substance use prevention or treatment -- that currently don't exist in your community -- would like to see more of?

12. What, if any, changes in access to prevention and treatment services have you observed in Cecil County over the past six months (i.e., the introduction of medetomidine into the drug supply)?

13. (a) Have you heard of Medetomidine or "Meda"?
    a. If so, what do you know about it?
        i. From your perspective, how has using opioids changed since you were aware that Medetomidine existed in your community?
    b. Where did you get information about medetomidine?
    c. How would you prefer to receive information on changes in the drug supply?
        i. Can you share any websites, groups, or places you trust to keep you informed about health-related topics?

9. (b) You talked about medetomidine earlier. What else do you know about it?

a. If so, what do you know about it?
    i. From your perspective, how has using opioids changed since you were aware that Medetomidine existed in your community?
b. Where did you get information about medetomidine?
c. How would you prefer to receive information on changes in the drug supply?
    i. Can you share any websites, groups, or places you trust to keep you informed about health-related topics?

Now, I would like to talk more about your specific experiences using drugs…

10. What drugs do you now use?
    a. How is this different, if at all, than before you became aware of Medetomidine in the drug supply?
    b. How do you consume drugs?
    c. How has your consumption of drugs changed, if at all, since you became aware of Medetomidine in the drug supply?

11. What strategies have you used to keep yourself safe from overdose since you have become aware of Medetomidine in the drug supply?
        i. Tester shots?
        ii. Using with other people?
        iii. Avoiding mixing drugs?
        iv. Going slowly?
        v. Testing your supply?
        vi. Other ways not mentioned?
    a. How do you believe the usefulness of these strategies might have changed over the last six months?

12. How has your experience of using opioids changed in the last 6 months (i.e., the introduction of medetomidine into the drug supply)?
    a. What do you expect to feel when you use opioids?
    b. Does your current use of opioids available to you feel similar to the opioids you're used to?
        i. If not, can you describe how the feeling differs?
            1. Do the highs feel different than they used to?
            2. How long does your high typically last?
            3. How long do you typically go between uses?
            4. What unexpected effects have you experienced? (e.g. Memory Loss, Waking up in unknown locations, etc.)

13. How do you think withdrawal symptoms are different than they used to be six months ago (i.e., the introduction of medetomidine into the drug supply)?
    a. What new or unique signs and symptoms of withdrawal have you observed or experienced?
    b. How has your management of withdrawal symptoms changed in the past six months?

c. Have you sought or received medical assistance for managing withdrawal in the past six months? If so, describe your experience receiving care for your withdrawal symptoms.
    i. Where did you seek care?
        1. Why did you choose this location?
    ii. What type of treatment did you receive?
    iii. Were you offered referrals to harm reduction?
    iv. Were you offered substance use treatment services?
        1. Did you follow-up? Why or Why not?
    v. Would you seek care at the same clinic or office location again?
        1. Why or why not?

The next question will cover your general observations about overdoses in Cecil County…

14. In general, how do you think overdoses are different than they used to be six months ago (i.e., before the introduction of medetomidine into the drug supply)?
    a. How long between opioid administration and overdose?
        i. When overdosing, did you or your friends "fall out" right away, perhaps with the spike still in their arm and the tourniquet on?
        ii. Or did it happen well after you or they injected?
    b. What new or unique signs and symptoms of an overdose have you observed or experienced?
    c. How has overdose response changed in the past few months?
        i. Naloxone amount/effectiveness
        ii. Rescue breathing

This part of the discussion is about your firsthand experience with overdose, a topic that can be sensitive and difficult to discuss. Let us know if you start to feel uncomfortable, need support, or wish to skip questions. Sharing your experiences and opinions, however, can help the community.

15. [For persons who have overdosed with in the past 6 months] Please describe the situation and place of the last time you overdosed?
    a. What do you think led to this overdose?
        i. Change in strength, quality, or purity of drugs? (i.e., new dealer?)
        ii. Change in drug use practices? (i.e., new setting, new people, test shots, mixing substances, etc?)
        iii. Relapse?
        iv. Recent period of abstinence? (i.e., jail, residential treatment, hospitalization?)
        v. Life circumstances or stressors? (i.e., housing instability, encampment disruptions, joblessness, etc?)
    b. What brought you out of the overdose?
        i. Did someone administer naloxone to reverse your overdose?
        ii. Was rescue breathing performed?
        iii. Other?
    c. Do you have any other experiences with overdose?

i. If so, how did this experience differ?

16. [For persons who have witnessed an overdose within the past 6 months] Please describe the situation and place of the last time you witnessed or personally responded to someone who was overdosing?
    a. How was it different than if it had happened a few years ago (i.e. before medetomidine)?
    b. What do you think led to this overdose?
        i. Change in strength, quality, or purity of drugs?
        ii. Change in drug use practices? (i.e., new setting, new people, test shots, mixing substances, etc?)
    c. What did you or someone else do in response to the overdose?
        i. Did someone administer naloxone to reverse this person's overdose?
        ii. How many naloxone doses were needed?
        iii. How well did naloxone work?
        iv. Was rescue breathing provided?
        v. What else was done?
    d. What was the outcome?

We are now going to ask your experience with and or interest in SUD treatment…

17. Can you tell me about your past experiences with substance use treatment?

18. Have you received treatment for a substance use disorder in the past six months?
    a. If you have not, are you interested in entering treatment for opioid-use disorder? *If they agree, refer them to an OADPOP representative for treatment connection after the interview*
        i. If yes, please describe the barriers to starting treatment.
        ii. If no, why are you not interested in treatment today?
            1. Are there any other services that you are interested in?

19. If you have started treatment, what has the process of initiating substance use treatment been like for you?
    a. Can you walk me through the process?
        i. As part of this process, did you start taking medication for your opioid use disorder?
        ii. If so, what medication?
    b. Why did you decide to enter treatment?
    c. Are you still engaged in treatment? *If they agree, refer them to an OADPOP representative for treatment connection after the interview*
    d. What challenges did you encounter initiating treatment?
    e. What challenges did you encounter staying engaged in treatment? (e.g., Behavioral health requirement, Sobriety/abstinence requirement, Unavailable in primary care, Need for a referral, Ease and availability of appointments, Stigma, Discrimination, Frequency of visits, transportation, etc.)

CONCLUSION

Thank you for taking the time to share with me today. Those are all the questions I have for you.

Is there anything else that we need to understand that we didn't touch on today? Is there anything else you'd like to add to our discussion before we end?

Ok, thank you. I'm going to [end our recording/stop taking notes] now [*End recording and note-taking*].

[*Share any additional information about dissemination of results/products*]

Appendix L. Medetomidine-involved Overdoses and Withdrawal Management Considerations

CLINICAL GUIDELINES

- Medetomidine Inpatient Withdrawal Management Guideline https://www.sciencedirect.com/science/article/pii/S0196064425014349?ref=pdf_download&fr=RR-2&rr=9c45bde288b8d481- University of Pittsburgh
- Medetomidine Outpatient Withdrawal Management Guideline - University of Pittsburgh
- Medetomidine Overdose and Withdrawal - Penn Center for Addiction Medicine and Policy (CAMP)
    - Opioid with suspected adulterant withdrawal ICU management
- Medetomidine Overdose and Withdrawal - Philadelphia Department of Public Health

RECOMMENDATIONS

The following practices for maintaining awareness about the risk of medetomidine overdose, assessing potential exposure, and treatment may be useful:

1. Maintain high index of suspicion for medetomidine:

Clinicians should maintain a high index of suspicion for overdose and withdrawal symptoms that may be associated with medetomidine, especially in patients presenting with atypical symptoms during suspected opioid overdoses, or there is detection of medetomidine in the local drug supply, reported by the local or state health department, poison center, NIST or CFRE.

Medetomidine is a tranquilizer, like xylazine, but is considered more potent. Medetomidine is an alpha-2-adrenergic agonist and non-opioid sedative and does **not** respond to opioid overdose reversal medications such as naloxone. Opioid overdose reversal medications should still be administered, however, due to the likely co-occurrence with opioids. Medetomidine has no approved uses in humans, although it is similar to dexmedetomidine (Precedex), which is used in humans for sedation of mechanically ventilated patients. It produces several physiological side effects, including sedation, analgesia, bradycardia, prolonged hypotension following initial hypertension and peripheral vasoconstriction. The sedation can last for 2-3 hours but may be prolonged when combined with opioids.

2. Recognize clinical features:

a) **Suspected medetomidine involvement:** Expect profound sedation, bradycardia, and pale, gray or blue skin discoloration. Because medetomidine is a non-opioid sedative with a main effect of heavy sedation, breathing may resume after naloxone administration, but the individual may remain sedated and unresponsive. These features can help distinguish medetomidine-involvement from typical opioid overdoses.

b) **Suspected medetomidine withdrawal syndrome:** Abrupt discontinuation of medetomidine may mirror typical opioid withdrawal syndrome, occurring rapidly, within hours of use and be much more severe compared to fentanyl or xylazine. Symptoms include ‘brain zaps’; severe pain; hypertension; tachycardia; intractable nausea and vomiting; excessive diaphoresis; shaking/tremors or seizures; agitation, delirium or emotional lability; weakness or perceived paralysis of extremities; catatonia or altered mental status; and temporary vision or hearing loss. Medetomidine withdrawal syndrome is a severe consequence often requiring admission to an ICU for treatment.

3. Conduct comprehensive assessment

Conduct thorough assessments for patients presenting with suspected opioid overdoses, including toxicology testing for medetomidine when available, particularly in cases where patients exhibit atypical toxidromes.

- **Administer naloxone:** Administer naloxone for all suspected opioid-involved overdoses, including those potentially involving medetomidine. Use of low-dose naloxone is preferred for opioid reversal. While naloxone will not reverse the effects of medetomidine, it remains crucial for addressing any co-occurring opioid effects. If breathing is adequate (at least one breath every five seconds and does not appear pale, gray or blue), additional naloxone is not required. Responding to opioid overdoses involving medetomidine should emphasize breathing over responsiveness. Continue monitoring and provide rescue breathing and airway support as needed and transition care to EMS/hospital.
- **Establish treatment protocols**: Hospitals should develop protocols for managing withdrawal symptoms that may include medetomidine, ensuring that treatment strategies are in place for aggressive management of opioid withdrawal and potential co-occurring medetomidine withdrawal.
    - Provide comprehensive supportive care for patients experiencing medetomidine toxicity, including cardiovascular and respiratory support, as these are critical for managing the effects of medetomidine.
    - Early screening for alcohol and benzodiazepine use and withdrawal should be prioritized, as these may co-occur with medetomidine withdrawal and complicate clinical management.
    - Consider expanding access to medications like dexmedetomidine for managing persistent hypertension and withdrawal symptoms, particularly in patients unable to tolerate oral medications due to vomiting or altered mental status.

4. Monitor for complications:

Given the potential for severe withdrawal symptoms, such as severe tachycardia and hypertensive emergencies, hospitals should be prepared for intensive monitoring and support, potentially requiring ICU-level care for patients presenting with these symptoms.

5. Improve education and awareness:

Educate healthcare providers and the public about the potential presence of medetomidine in the illegal drug supply and its associated risks, including the need for heightened awareness of its effects. Clinicians observing atypical toxidromes in suspected opioid overdoses should report these cases to local health departments and poison centers and pursue toxicology testing to enhance understanding and response to emerging threats. Other states have released health advisories for raising awareness quickly to a broad audience.

These patient and provider-related materials may be useful resources:

- Maryland Addiction Consultation Service (MACS), University of Maryland School of Medicine: MACS provides support to prescribers and their practices, pharmacists, and healthcare teams in addressing the needs of patients with SUD and chronic pain management. They have developed this Medetomidine one-pager for providers.
- Maryland Poison Center is available 24 hours a day and can provide treatment advice and education for providers.
- Webinar for providers:
    - July 2025 CDC Webinar: Clinical Implications of Medetomidine Mixed with Opioids
    - December 2025 Tennessee Harm Reduction Project ECHO: Medetomidine: Best Practices for a Changing Drug Supply

    - April 2025 Penn CAMP Webinar: An Emerging Adulterant in Philadelphia: Medetomidine Withdrawal in People Who Use Fentanyl

Health advisory notices can be used to rapidly disseminate critical, evidence-based information about emerging threats to clinicians, first responders, and the public. These alerts enhance early recognition, promote timely and appropriate clinical response, and strengthen coordination across healthcare and emergency systems, ultimately reducing morbidity and mortality. Included below are some health advisories that may be helpful:

- Chicago Department of Health: Alert Detail (HAN) – Medetomidine in Chicago's Drug Supply
- Minnesota Department of Health: Health Advisory: Sedative Associated Overdoses
- Philadelphia Department of Health:
    - 12/10/2024: Health Alert - Severe and Worsening Withdrawal in Philadelphia
    - 08/01/2024: Health Advisory - Medetomidine Has Been Detected in the Illicit Drug Supply
    - 05/13/2024: Health Alert - Medetomidine Has Been Detected in the Illicit Drug Supply
- Drug Enforcement Agency - Medetomidine and Dexmedetomidine Submissions Increase Significantly
- Center for Forensic Science Research and Education (CFSRE): Medetomidine Public Alert

Appendix M. Baltimore City Key Informant Interviews

Baltimore City Key Informant Interviews

Hello, [*Name/Names*]. Thank you for taking the time speak with us today! My name is [*Insert name*] and I am one of the Epidemic Intelligence Officers from the CDC, working in Baltimore for the next few days in response to the mass overdose events that occurred on July 10th and 18th in Baltimore city. I'll turn it over to my colleagues [*next person provides introduction*].

The purpose of this meeting is for us to get a better understanding of the situation in Baltimore city, your organizations' efforts related to substance use and overdose, and who the other key players are. We are aiming to use these findings to help understand existing programs and response efforts, and inform future data collection and response planning.

This interview should last around *45 minutes to 1 hour*. We will not be recording, or using any identifying information but we would like to take notes.

Do you have any questions before we begin?

Key Informant Questions

1. Would you tell us about your position and what your work entails?
    - Has your role changed as a result of recent overdose events and trends in Baltimore? How did it change?
2. Would you tell us about the overall trends in opioid-related overdoses and the mass overdose events that occurred on July 10th and 18th in Baltimore?
    - What trends have you noticed in opioid-related overdoses?
    - If you have observed an increase or decrease in the number of overdoses, why do you think that is?
3. What are the barriers, e.g., transportation, financial, insurance, etc., to accessing substance use-related services, such as harm reduction services, treatment and recovery in Baltimore?
    - What could be done differently to help clients overcome access barriers?
4. Would you tell us about your organization's response to the mass overdose events that occurred on July 10th and July 18th in Baltimore?
    - How prepared was your organization?
        - When and how did your organization learn about the mass overdose events?
        - What access did you have to the appropriate/relevant emergency response protocol, equipment, training, knowledge, or experience working with the communities impacted or at risk, etc.?
        - What additional resources or support would strengthen your response efforts?
    - What strategies were employed?
        - What information was shared?
        - How was information attained and shared?
    - What would you say are things that went well during the response?
    - What would you say are opportunities for improvement?

5. How have these mass overdose events impacted the community, including service providers and persons who use drugs?
    - Did these events facilitate any changes, e.g., creation of protocols, communication channels, data sharing?
    - What impacts did you anticipate?
    - Were there any impacts that surprised you or were not expected?
6. What additional resources or support would strengthen response work in Baltimore?
    - Besides additional funding, what top 3 resources would be most helpful?
7. Has the mass overdose events changed your organization's approach to overdose response? If so, what changes were made?
8. What other organizations or people should we speak with?
9. Is there anything else that would be useful for us to know?

Demographic Questions

1. What sector do you work in?
2. How many years of experience do you have working in overdose prevention/response?
3. How many years of experience does your organization have working in overdose prevention/response?
4. What other sectors or organizations does your organization work with regularly?

Appendix N. Medical Chart Abstraction Protocol

INTRODUCTION

Chart Abstraction: The purpose of abstracting this data is to identify patients and characterize patients experiencing medetomidine withdrawal.

Chart Selection:
Charts (patient visits) are selected in one of two ways. The first is selection by the organization/facility, where the partners decide which patient visits will inform the joint objectives. The second is by identifying patient visits with a discharge diagnosis of opioid withdrawal in the timeframe of interest. Codes to consider are for opioid withdrawal: F11.13, F11.23, F11.93, and other psychoactive substance withdrawal: F19.13, F19.23, F19.93. Other ICD-10-CM codes of interest are F13.13; F11.23; F13.93.

Deidentification:
Each visit is linked to a unique identifier. Enter the chart abstraction data into REDCap form or other data entry software by selecting the unique identifier linked to each individual patient visit. The linkage between FIN number and unique ID will be destroyed at the completion of data entry.

Chart Abstraction:
Abstractors will start by reviewing the visit notes from the medical chart to determine if the visit is for opioid withdrawal. Next, the abstraction will determine if the visit meets the case definition using the suggested clinical criteria. Irrespective of case designation, the abstractor will fill out the first section of the form. This section captures whether the record included any of the screening criteria, if the patient left against medical advice, and case designation. Records that are confirmed, probable, or suspect will be abstracted in entirety. For non-cases, abstractor will only fill out the first section of the form.

SECTION INSTRUCTIONS

In REDCap, select the RecordID associated with the FIN number for the observation. In Powerchart, enter the FIN number into the 'Patient Search'. Review all the visit notes for an overview of the visit and determine if the observation is a potential case. Use the section below to help with this determination.

Record Keeping:

- Record ID
  - 000; 001; 002; etc.
  - This is auto populated
- Today's Date:
  - mm/dd/yyyy
  - Enter the date of chart abstraction
- Reviewer:
  - Select abstractor name from dropdown list
- Record Type:
  - Hospital Record; Other
  - Select if the record is from a hospital electronic health record or select other it is an EMS report or other care service.
- Unique Identifier:
  - 301; 302; etc.
  - Enter the PatientID from the patient deidentification excel sheet
- Date of Service:
  - mm/dd/yyyy
  - Enter the date the patient arrived at the hospital or other facility.
- Clinical Presentation Screener:
  - Hypertension; Tachycardia; Nausea; Vomiting; Encephalopathy; Delirium; Shaking/Tremors [Select all that apply]
  - Review the chart notes and select the patient's clinical signs and symptoms. These symptoms can occur at any time during the hospital stay.
- Did the patient discharge against medical advice?:
  - Yes; No; Unknown
  - Report whether the patient stayed at the hospital until officially discharged or if they left against the medical advice of their provider.
  - The intention is to collect this data for all selected visits because some non-cases may be because they patient did not stay long enough to be full evaluated.
- Case Classification for Withdrawal:
  - Confirmed; Probable; Suspect; Not a Case; To be determined
  - Use the case criteria to determine if the patient's visit meets the case criteria.

Demographics:

- Year of birth:
  - yyyy
  - Enter the year of birth
- Age:
  - ## years
  - Enter the patient's age
- Sex:
  - Male; Female; Unknown
  - Enter the patient's sex
- Race/Ethnicity:
  - American Indian or Alaskan Native; Asian; Black; Hispanic or Latino; Native Hawaiian or other Pacific Islander; White; Other; Unknown
  - Select the patient's reported race/ethnicity
- Marital Status:
  - Divorced; Married; Single; Widowed; Unknown
  - Select the patient's marital status
- Employment Status:
  - Employed; Not Employed; Person with a disability; Retired; Self-employed; Student; Unknown
  - Select the patient's employment status
- Primary health insurance:
  - Medicaid; Medicare; Private; Uninsured; Other; Unknown
  - Select the primary health insurance
- Homelessness:
  - Yes – Current; Not recorded; Unknown;
  - Select not recorded – do not use unknown field
- Incarceration:
  - Yes – Current; Not recorded; Unknown
  - Select not recorded – do not use unknown field
- Free text on demographics
  - Record any clarifying information and include previous incarceration if listed

Prior Substance Use:

- Does the patient have a history of drug use?:
  - Alcohol; Cannabis; Other cannabinoids; Fentanyl; Heroin; Other opioids; Benzodiazepines, Other sedatives; Tobacco use; Hallucinogens, Cocaine, Other stimulants; Other drugs; Unknown; None
- Does the patient currently or did they previously use a medication for substance use disorder? (s):
  - Yes; No; Unknown
- Free text on prior substance use

Presentation to emergency department or hospitalization:

- How did the patient arrive at the hospital?:
    - Emergency transport to hospital; Emergency response but refused transport; Physician referral, Self-referral, Other, Unknown
    - Record how the patient came to be at the facility, with self-referral indicating they came to the hospital of their own means.
- Patient reported substance(s) and method(s) of use related to ED visit:
    - Benzodiazepines; Cannabis; Cocaine; Fentanyl; Heroin; Methamphetamines; Other Opioid; Other; Unknown [Select all that apply]
    - Select all the substances that are listed in the medical record and use free text for the method of use. For the use, report one of the following options: Inject, Inhale, Ingest, Smoke, Snort, Rectal, Other, or Not Reported.
- Where did the patient receive care?: Field (e.g. EMS); Emergency department; Intensive care unit; Progressive care unit; Other In-patient; [Select all that apply]
- Length of hospital stay: Free text ##
- Add a free text section

OVERDOSE EVENT

- Is the ED visit related to a specific overdose event?:
    - Yes; No; Unknown
        - If overdose event, what was the location of overdose event: Home; Other Residence; Other Private setting; Public transit; Public place; Other; Unknown;
        - If overdose event, was this the patient's first overdose?: Yes; No; Unknown
        - If overdose event, did anyone administer naloxone at the location of the overdose?: Yes – bystander; Yes – EMS; Yes – police; Yes – unknown; No; Unknown
        - If overdose event and naloxone administered, how did the patient respond to naloxone?: Symptoms were resolved; Symptoms were partially resolved; Patient remained symptomatic; Patient developed new symptoms; Unknown; Not Applicable
        - Free text on overdose event (include patient behaviors, signs and symptoms, treatment):

Underlying Health Conditions:

- Does the patient have any of the following health conditions?:
    - Substance use; Mental Health; Syndemic; Heart Disease; Lung Disease; Neurological Disorder; Other Underlying Health Condition; Unknown;
        - Substance Use
            - Mental Health: Depression/dysthymia; Bipolar disorder; Schizophrenia; Anxiety disorder; Post-traumatic stress disorder; Attention Deficit/Hyperactivity Disorder (ADHD); Eating disorder; Obsessive-compulsive disorder; Autism Spectrum (including Asperger's Syndrome); Other Mental health disorder;
- Patient's prescribed home medications:

    - Cardiac; Pain; Psychological; Other; None; Unknown [Select all that apply]
- Was the patient on any medications for substance use disorder at the time of overdose?:
    - Buprenorphine; Methadone; Naltrexone; Other; None; Unknown [Select all that apply]
- Free text for underlying health conditions

Presenting signs and symptoms:

- Did the patient present with any of the following signs and symptoms for withdrawal in the field (EMS)?
    - Altered mental status; Bradycardia; Bradypnea; Hypertension; Hypoxia; Myosis; Tachycardia; Wounds; Memory loss; Extended sleep (Prolonged sedation); Waxing/Waning alertness; Nausea; Vomiting; Diarrhea; Anxiety; Irritability/Agitation; Diaphoresis; Tremors; Persistent QTc prolongation; Chest pain; Leukocytosis; Body Aches/Myalgias; Other; None; Unknown
    - Fill out this section if 'Field' was selected
- Did the patient present with any of the following signs and symptoms for withdrawal at start of emergency department visit?
    - Altered mental status; Bradycardia; Bradypnea; Hypertension; Hypoxia; Myosis; Tachycardia; Wounds; Memory loss; Extended sleep (Prolonged sedation); Waxing/Waning alertness; Nausea; Vomiting; Diarrhea; Anxiety; Irritability/Agitation; Diaphoresis; Tremors; Persistent QTc prolongation; Chest pain; Leukocytosis; Body Aches/Myalgias; Other; None; Unknown
    - Fill out this section if 'Emergency Department' was selected
- Did the patient present with any of the following symptoms for withdrawal during hospital stay?
    - Altered mental status; Bradycardia; Bradypnea; Hypertension; Hypoxia; Myosis; Tachycardia; Wounds; Memory loss; Extended sleep (Prolonged sedation); Waxing/Waning alertness; Nausea; Vomiting; Diarrhea; Anxiety; Irritability/Agitation; Diaphoresis; Tremors; Persistent QTc prolongation; Chest pain; Leukocytosis; Body Aches/Myalgias; Other; None; Unknown
    - Fill out this section if 'ICU' or 'PCU' was selected
- Vitals: Heart rate; Blood pressure; Respiratory rate; O2
- Free text on symptoms

Treatment:

- Did the patient receive naloxone in the hospital?:
    - Yes; No; Unknown
- If they received naloxone, did the patient improve with naloxone?:
    - Yes; No; Unknown ;Not Applicable
- What medications did the patient receive for overdose:
    - Naloxone; Buprenorphine; Methadone; Other [Select all that apply]
    - This section is for what the patient used for opioid use
- What medications did the patient receive for withdrawal?:

    - Precedex (Dexmedetomidine); Clonidine; Olanzapine; Hydroxyzine; Benzodiazepines; Prochlorperazine; Chlorpromazine; Short acting opioids; Ketamine; Acetaminophen and NSAIDs; Gabapentin; Lofexidine; Tizanidine; Dilaudid (Hydromorphone); Ondansetron;
- Free text on treatment

Interventions

- Did the patient receive respiratory support?:
    - Intubation; CPAP/BiPAP; Supplemental oxygen; None Recorded; Unknown [Select all that apply]
- Free text on interventions (include number of times intubated if available):

Complications

- What complications did the patient experience?:
    - Acidosis; Acute kidney injury; Pneumonia; Brain injury; Cardiac injury; Cardiac arrest; Encephalopathy ; Respiratory failure; Rhabdomyolysis; Sepsis; Traumatic injury; Autonomic Instability; Other; None [Select all that apply]
- Did the patient get an EKG?: Yes; No; Unknown
- Free text on complications

Linkage to Care:

- Was the patient started (or continued) on medications for opioid use disorder (buprenorphine, methadone, or naltrexone)?
    - Yes; No; Unknown; Not applicable
- Was the patient referred to treatment services?:
    - Yes; No; Unknown; Not applicable
    - This is referral to other inpatient or outpatient treatment facility
- Was the patient was given or prescribed naloxone at discharge?
    - Yes; No; Unknown; Not applicable
- Was the patient referred to harm reduction services?:
    - Yes; No; Unknown; Not applicable
    - This is referral to Voices of Hope or Serenity; other peer support services
- Free text for linkage to care (write specifics about the referrals; declining care)

Toxicology Reports:

- Was toxicology testing performed? Yes; No; Unknown;
- Free text on toxicology

Final notes:

- Free text to include brief summary of patient
- Free text to include additional vernacular to know (for example: “Meda”; “Tranq”; “Zaps”)

Appendix O. REDCap Medical Chart Abstraction Tool

Confidential

Chart Abstraction

Record ID	_____
Record Keeping	
Today's Date	_____
Reviewer	◯ Kate ◯ Emilia ◯ Nhia ◯ Katie
Record Type	☐ Hospital Record ☐ Other _____
Date of Service	_____
Clinical Presentation Screener [select all that apply]	☐ Delirium ☐ Encephalopathy ☐ Hypertension ☐ Nausea ☐ Shaking/Tremors ☐ Tachycardia ☐ Vomiting
Did the patient discharge against medical advice?	◯ Yes ◯ No ◯ Unknown
Case Classification for Withdrawal	◯ Confirmed ◯ Probable ◯ Suspect ◯ Not a case ◯ To be determined
Demographics	
Year of Birth	_____
Age	_____
Sex	◯ Male ◯ Female ◯ Unknown

Race/Ethnicity	☐ American Indian or Alaska Native ☐ Asian ☐ Black ☐ Hispanic or Latino ☐ Native Hawaiian or Other Pacific Islander ☐ White ☐ Other Race _____ ☐ Unknown
Marital Status	◯ Divorced ◯ Married ◯ Single ◯ Widowed ◯ Unknown
Employment Status	◯ Employed ◯ Not employed ◯ Person with a disability ◯ Retired ◯ Self-employed ◯ Student ◯ Unknown
Primary Health Insurance	◯ Medicaid ◯ Medicare ◯ Private ◯ Uninsured ◯ Other _____ ◯ Unknown
Homelessness	◯ Yes - Current ◯ Not recorded ◯ Unknown
Incarceration	◯ Yes - Current ◯ Not recorded ◯ Unknown
Demographics - Additional Information	_____

Prior Substance Use

Does the patient have a history of drug use?	☐ None ☐ Alcohol ☐ Benzodiazepines ☐ Cannabis ☐ Cocaine ☐ Fentanyl ☐ Hallucinogens ☐ Heroin ☐ Tobacco use ☐ Other cannabinoids ☐ Other opioids ☐ Other sedatives ☐ Other stimulants ☐ Other drugs _____ ☐ Unknown
Does the patient currently or did they previously use a medication for opioid use disorder?	◯ Yes ◯ Not recorded
Prior Substance Use - Additional Information	_____

Presentation to Emergency Department or Hospitalization

How did the patient arrive at the hospital?	◯ Emergency transport to hospital ◯ Emergency response but refused transport ◯ Physician referral ◯ Self-referral ◯ Other_____ ◯ Unknown

Patient reported substance(s) and method(s) of use related to ED visit [Select all that apply]

Substance	Method of Use (Inhale, Ingest, Smoke, Snort, Rectal, Other)
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

_____ _____

_____ _____

Where did the patient receive care? [Select all that apply]	☐ Field (e.g. EMS) ☐ Emergency department ☐ Intensive care unit ☐ Progressive care unit ☐ Other In-patient_____
Was the patient admitted to the hospital and/or ICU? [Select All That Apply]	☐ Hospital ☐ ICU ☐ No ☐ Unknown
Length of ED/hospital stay _____ _____	
Hospital Presentation - Additional Information	_____

Overdose Event	
Is the ED visit related to a specific overdose event?	◯ Yes ◯ No ◯ Unknown
If overdose event, what was the location of overdose event?	◯ Home ◯ Other Residence ◯ Other Private setting ◯ Public transit ◯ Public place ◯ Other location _____ ◯ Unknown
If overdose event, was this the patient's first overdose?	◯ Yes ◯ No ◯ Unknown
Has the patient previously been seen in the ED or hospitalized for a drug overdose?	◯ Yes ◯ No ◯ Unknown
What date(s) was this patient previously seen in the ED or hospitalized for overdose? (if multiple dates present, separate dates by semicolons ;)	_____

If overdose event, did anyone administer naloxone at the location of overdose?	◯ Yes - bystander ◯ Yes - EMS ◯ Yes - police ◯ Yes - unknown ◯ No ◯ Unknown
How was the naloxone administered?	_____
How many doses or mg of naloxone were administered? _____ _____	
How did the patient respond to naloxone?	◯ Symptoms were resolved ◯ Symptoms were partially resolved ◯ Patient remained symptomatic ◯ Patient developed new symptoms ◯ Unknown
Overdose event - Additional information (include patient behaviors, signs and symptoms, treatment)	_____

Underlying Health Conditions & Medications

Does the patient have any of the following health conditions? [Select all that apply]	☐ None ☐ Substance Use ☐ Mental Health ☐ Syndemic ☐ Heart Disease ☐ Lung Disease ☐ Neurological Disorder ☐ Other Underlying Health Conditions ☐ Unknown
Substance Use Conditions [Select All That Apply]	☐ Alcohol use disorder ☐ Chronic pain ☐ Opioid use disorder (previously diagnosed) ☐ Other substance use disorder _____
Mental Health Conditions [Select All That Apply]	☐ Anxiety disorder (GAD) ☐ Attention deficit hyperactivity disorder (ADHD) ☐ Bipolar disorder ☐ Depression/dysthymia (MDD) ☐ Personality disorder ☐ Post-traumatic stress disorder (PTSD) ☐ Schizophrenia ☐ Other mental health disorder_____
Syndemic Conditions [Select All That Apply]	☐ HIV ☐ Hepatitis C ☐ Tuberculosis ☐ Sexually transmitted infection, current ☐ Sexually transmitted infection, prior ☐ Other _____
What is the current sexually transmitted infection?	_____

Heart Disease [Select All That Apply]	☐ Chronic heart failure (CHF) ☐ Coronary artery disease (CAD) ☐ Hypertension ☐ Previous MI ☐ Previous Stroke ☐ Other _____
Lung Disease [Select all that apply]	☐ Asthma ☐ Chronic obstructive pulmonary disorder (COPD) ☐ Other _____
Neurological Disorder [Select all that apply]	☐ Seizures ☐ Epilepsy ☐ Traumatic Brain Injury (TBI) ☐ Other Neurological Disorder _____
Other Underlying Health Condition(s) [Select all that apply]	☐ Chronic Kidney Disease ☐ Chronic Pain ☐ Diabetes ☐ Obesity ☐ Other _____
Was patient on any medications for substance use disorder at the time of ED/hospital visit? [select all that apply]	☐ Buprenorphine ☐ Methadone ☐ Naltrexone ☐ Other _____ ☐ None ☐ Unknown
Patient's Prescribed Home Medications [select all that apply]	☐ Cardiac _____ ☐ Pain _____ ☐ Psych _____ ☐ Other _____ ☐ None ☐ Unknown
Additional information on underlying health conditions & medications (copy and paste med list free text here)	_____

Presenting Signs and Symptoms

Did the patient present with any of the following signs and symptoms for withdrawal in the field (EMS)? [Select All That Apply]	☐ None ☐ Altered mental status ☐ Anxiety ☐ Body Aches/Myalgias ☐ Bradycardia ☐ Bradypnea ☐ Chest pain ☐ Diaphoresis ☐ Diarrhea ☐ Extended sleep (Prolonged sedation) ☐ Hypertension ☐ Hypoxia ☐ Irritability/Agitation ☐ Leukocytosis ☐ Memory loss ☐ Myosis ☐ Nausea ☐ Persistent QTc prolongation ☐ Tachycardia ☐ Tremors ☐ Vomiting ☐ Waxing/Waning alertness ☐ Wounds ☐ Other _____ ☐ Unknown
Did the patient present with any of the following signs and symptoms for withdrawal at start of emergency department visit? [Select All That Apply]	☐ None ☐ Altered mental status ☐ Anxiety ☐ Body Aches/Myalgias ☐ Bradycardia ☐ Bradypnea ☐ Chest pain ☐ Diaphoresis ☐ Diarrhea ☐ Extended sleep (Prolonged sedation) ☐ Hypertension ☐ Hypoxia ☐ Irritability/Agitation ☐ Leukocytosis ☐ Memory loss ☐ Myosis ☐ Nausea ☐ Persistent QTc prolongation ☐ Tachycardia ☐ Tremors ☐ Vomiting ☐ Waxing/Waning alertness ☐ Wounds ☐ Other _____ ☐ Unknown

Did the patient present with any of the following signs and symptoms for withdrawal during hospital stay? [Select All That Apply]	☐ None ☐ Altered mental status ☐ Anxiety ☐ Body Aches/Myalgias ☐ Bradycardia ☐ Bradypnea ☐ Chest pain ☐ Diaphoresis ☐ Diarrhea ☐ Extended sleep (Prolonged sedation) ☐ Hypertension ☐ Hypoxia ☐ Irritability/Agitation ☐ Leukocytosis ☐ Memory loss ☐ Myosis ☐ Nausea ☐ Persistent QTc prolongation ☐ Tachycardia ☐ Tremors ☐ Vomiting ☐ Waxing/Waning alertness ☐ Wounds ☐ Other _____ ☐ Unknown

Vitals	Initial EMS	Initial Hospital	Min	Max
Heart Rate	_____	_____	_____	_____
Blood Pressure	_____	_____	_____	_____
Respiratory Rate	_____	_____	_____	_____
O2	_____	_____	_____	_____

Presenting Symptoms - Additional information	_____

Treatment

Did the patient receive naloxone in the hospital?	◯ Yes ◯ No ◯ Unknown
Naloxone dosage form	☐ Intranasal ☐ Intravenous, bolus ☐ Intravenous, continuous infusion ☐ Subcutaneous
Naloxone dose (Strength, route, and frequency/number of times administered)	_____ (i.e. 2mg intranasal x1, 2mg IV)
Did the patient improve with naloxone?	◯ Yes ◯ No ◯ Unknown
What medications did the patient receive for overdose? [Select all that apply]	☐ Naloxone ☐ Buprenorphine ☐ Methadone ☐ Other_____

What medications did the patient receive for withdrawal?	☐ Acetaminophen and NSAIDs ☐ Benzodiazepines ☐ Chlorpromazine ☐ Clonidine ☐ Gabapentin ☐ Hydromorphone (Dilaudid) ☐ Hydroxyzine ☐ Ketamine ☐ Lofexidine ☐ Olanzapine ☐ Ondansetron ☐ Precedex (Dexmedetomidine) ☐ Prochlorperazine ☐ Short acting opioids ☐ Tizanidine ☐ Other_____
Treatment - Additional information (e.g., Reason for no treatment provided, if applicable)	_____

Interventions

Did the patient receive respiratory support?	◯ Yes ◯ No ◯ Unknown
Did the patient receive supplemental oxygen?	◯ Yes ◯ No ◯ Unknown
Which route of supplemental oxygen?	◯ Nasal Cannula ◯ Mask ◯ Unknown
Did the patient receive CPAP/BiPAP?	◯ Yes ◯ No ◯ Unknown
Was the patient intubated?	◯ Yes ◯ No ◯ Unknown
Date intubated	_____
Was the patient extubated?	◯ Yes ◯ No ◯ Unknown
Date extubated	_____
Interventions - Additional Information (include number of times intubated if available)	_____

Complications	
What complications did the patient experience? [Select all that apply]	☐ None ☐ Acidosis ☐ Acute kidney injury (AKI) ☐ Aspiration pneumonitis or pneumonia ☐ Autonomic Instability ☐ Brain injury (anoxic/hypoxic) ☐ Cardiac injury (MI/NSTEMI) ☐ Cardiac arrest ☐ Encephalopathy ☐ Respiratory failure ☐ Rhabdomyolysis ☐ Sepsis ☐ Traumatic injury ☐ Other _____
Acidosis labs? (i.e. pH)	_____
AKI labs? (i.e. SCr)	_____
Cardiac Injury labs? (i.e. max troponin)	_____
Rhabdo labs? (i.e. CK)	_____
Did the patient get an EKG?	◯ Yes ◯ No ◯ Unknown
What was the EKG rhythm? Describe if abnormal.	_____
Complications - Additional Information	_____

Disposition	
Identify outcome of hospital/ED visit	◯ Patient was discharged ◯ Patient is deceased ◯ Patient left against medical advice ◯ Other_____
Disposition - Additional Information (e.g., additional information about where the patient was discharged)	_____

Linkage to Care	
Was the patient started (or continued) on medications for opioid use disorder (buprenorphine, methadone, or naltrexone)?	◯ Yes ◯ No ◯ Unknown ◯ Not Applicable
Was the patient referred to treatment services?	◯ Yes ◯ No ◯ Unknown ◯ Not Applicable
Was the patient was given or prescribed naloxone at discharge?	◯ Yes ◯ No ◯ Unknown ◯ Not Applicable
Was the patient referred to harm reduction services?	◯ Yes ◯ No ◯ Unknown ◯ Not Applicable
Linkage to Care - Additional Information (write specifics about the referrals; declining care)	_____

Toxicology Reports	
Was toxicology testing performed?	◯ Yes ◯ No ◯ Unknown
What specimens were tested? [Select all that apply]	☐ Blood ☐ Urine

Which drugs were positive according to blood testing?	☐ Acetaminophen ☐ Amphetamine ☐ Alcohol ☐ Barbiturate ☐ Benzodiazepine _____ ☐ Buprenorphine ☐ Cannabis ☐ Cocaine ☐ Diphenhydramine ☐ Fentanyl ☐ Heroin ☐ Hydrocodone ☐ Hydromorphone ☐ Ketamine ☐ Medetomidine ☐ Methadone ☐ Morphine ☐ Oxycodone ☐ Oxymorphone ☐ Phencyclidine ☐ Tramadol ☐ Quetiapine ☐ Xylazine ☐ Other opioid _____ ☐ Other non-opioid _____
What was blood alcohol content (BAC) level? (i.e., 0.XXX in mg/dl)	_____
Which drugs were positive according to urine testing?	☐ Acetaminophen ☐ Amphetamine ☐ Alcohol ☐ Barbiturate ☐ Benzodiazepine _____ ☐ Buprenorphine ☐ Cannabis ☐ Cocaine ☐ Diphenhydramine ☐ Fentanyl ☐ Heroin ☐ Hydrocodone ☐ Hydromorphone ☐ Ketamine ☐ Medetomidine ☐ Methadone ☐ Morphine ☐ Oxycodone ☐ Oxymorphone ☐ Phencyclidine ☐ Tramadol ☐ Quetiapine ☐ Xylazine ☐ Other opioid _____ ☐ Other non-opioid _____
Toxicology - Additional Information	_____

Additional Notes	
Please provide any additional information not captured elsewhere (e.g., brief summary of patient)	_____
Vernacular Description (e.g., "Meda", "Tranq", "Zaps")	_____