

Special Article - Health Policy

# Fentanyl Test Strip Use and Overdose History among Individuals on Medication for Opioid Use Disorder

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## Abstract

**Background:** The number of deaths from drug overdose in the United States has more than doubled in the past decade. In particular, drug overdose deaths involving fentanyl have doubled every year since 2013. Rapid fentanyl test strips (FTS) are a useful strategy for detecting traces of fentanyl in substances and have received overwhelming support from individuals with opioid-dependence.

**Methods:** We investigated fentanyl use, knowledge of FTS, willingness to use FTS, and overdose history among a sample of 105 individuals currently on medication for opioid use disorder (MOUD).

**Results:** Results showed that the majority (63%) of the sample had experienced a non-fatal overdose and that 85% of participants were willing to use FTS. The majority of participants reported concern about fentanyl in their drug supply (70%) and 77% reported likelihood of past unintentional fentanyl use. Of note, only about half (47%) of participants knew of FTS prior to being surveyed, and only 17% reported ever using FTS.

**Conclusion:** These results expand on previous literature that documents high levels of willingness, yet low uptake of FTS among individuals on MOUD. Widespread education about FTS, in addition to the implementation of the use of FTS, is a highly promising and critical primary prevention alternative to overdose treatment and/or death due to fentanyl.

**Keywords:** Fentanyl; Fentanyl test strips; Medication for opioid use disorder; Opioid overdose; People who inject drugs

## Introduction

Drug overdose deaths in the United States have exponentially increased in the past decade [1], as synthetic opioids such as fentanyl have become increasingly prevalent among populations who use illicit drugs. Synthetic opioids are 50-100 times more potent than heroin, thus are incredibly dangerous when present in drug supplies [2]. Alarming, death rates involving fentanyl overdose have doubled each year since 2013, with over 85% of overdose deaths in 2016 involving fentanyl [3]. These trends in overdose deaths prompted the Department of Drug Enforcement Administration to issue a nationwide alert, identifying fentanyl-related overdoses as a threat to public health and safety [4].

As alarming rates of overdose deaths have spread across the country, greater prevention efforts are needed to address the threat. Naloxone is a medication designed to rapidly reverse the effects of an overdose when administered in a timely manner [5], and is a commonly used tertiary prevention strategy that saves lives from opioid overdose. Most recently, the fentanyl test strip (FTS) has emerged as an innovative drug-checking tool to address the opioid overdose crisis [6,7]. Unlike naloxone, it is a primary prevention strategy that can be used to detect traces of fentanyl in substances before ingestion, thus preventing unintentional fentanyl exposure and accidental overdose if used appropriately. FTS provides an opportunity for substance users to test their drug supply for fentanyl in a private setting, allowing them to make their own choices and be

in control of their overdose risk [8,9].

Individuals who use illicit opioids have unanimously supported the use of FTS to reduce overdose risk [6-8,10-15]. However, people on medication for opioid use disorder (MOUD) have been under-represented in these studies. Other studies have indicated that people on MOUD continue to engage in illicit substance use [16-18], yet are more likely to engage in FTS-related harm reduction strategies to prevent overdose [19]. Use of MOUD treatment increased nationally by 65% in recent years, with the New England region providing higher rates of MOUD accessibility than other parts of the United States [20], demanding greater research on the harm reduction behaviors among persons on MOUD in the northeast. With an average of over 130 people dying each day from opioid overdose [21], more knowledge is needed on the prevalence of fentanyl use and use of FTS to aid in reducing overdose rates in high risk groups of individuals on MOUD. In the present study, we investigated willingness to use FTS among a sample of 105 participants on MOUD in New Haven, CT.

## Methods

### Participants

Participants were recruited between July 2018 and October 2019 from a sample of individuals in treatment for opioid use disorder to study HIV prevention and harm reduction behaviors [22, 23]. Participants were eligible for the study if they were: a) at least 18 years or older; b) self-reported HIV-negative or unaware of HIV status;

c) self-reported drug- and/or sex-related HIV risk behaviors (e.g., needle sharing, unprotected sex) in the past 6 months; d) met DSM-V criteria for opioid use disorder (OUD); and e) currently on MOUD treatment. All participants included in the sample were stabilized on methadone.

### Study procedures

Participants were recruited from an addiction treatment program (APT Foundation, Inc.) in New Haven, Connecticut. It is the largest addiction treatment center in Connecticut with over 7,000 patients on MOUD. Recruitment methods included snowball sampling by using clinic-based advertisements and flyers, word of mouth, and referrals from counselors. All screening and interviews were conducted privately by trained research assistants. Upon informed consent, participants were asked to complete a survey using audio computer-assisted self-interview (ACASI), which took approximately 45 minutes. Participants were reimbursed \$25 for their time. The study protocol was approved by the Institutional Review Board at the University of Connecticut and received board approval from the APT Foundation Inc.

### Measures

Participant demographics were collected, including age, self-reported sex, sexual orientation, ethnicity, marital status, education status, housing status, income, and visits with a primary care physician in the past year (Table 1). Substance use characteristics were also measured, including current methadone dose and Alcohol Use Disorder.

Illicit drug use, overdose history and prevention, and fentanyl use characteristics were measured (Table 2). These measurements included heroin use, polysubstance use (two or more substances), and daily injection in the past 30 days. Overdose characteristics included dichotomous (yes or no) measurements of experiencing an overdose, witnessing an overdose, or knowing someone who had died from an overdose. Overdose prevention measures included knowledge of naloxone (e.g., Narcan) accessibility and keeping a personal supply of naloxone to treat potential overdose. Fentanyl-related measures included concern about fentanyl being in drug supply, likelihood of past drug supply containing fentanyl, and personal desire to know if a drug supply contains fentanyl. Data were also collected regarding prior knowledge of FTS, knowledge of where to obtain FTS, willingness to use FTS, and past FTS use.

Intentional fentanyl use was measured by asking participants if they had ever purposely used fentanyl, and if they had purposely used fentanyl in the past 30 days. Table 3 measures include route of primary fentanyl use, frequency of fentanyl use, and source for participants who indicated they had ever purposefully used fentanyl.

### Data analysis

Data were analyzed using IBM SPSS v.25. We conducted Chi-squared analyses to investigate differences in FTS outcomes between demographic and clinical groups (sex, education level, housing status, overdose history, etc.); setting the significance level to  $p < 0.05$ . Some demographic variables were recategorized for data analysis due to small portions of participants in categories (e.g., sexual orientation, ethnicity, housing status, and annual income).

## Results

Among this sample of 105 participants on MOUD, 55% were male, 78% identified as White, and 70% had at least a high school education. A majority of the sample (53%) reported experiencing homelessness in the past year, an annual income of less than \$10,000 (73%), and moderate to severe depression (78%). All 105 participants were on methadone, with an average dose of 84.6 mg.

Polysubstance use was reported by a majority of the sample (85%), while 19% reported injecting drugs daily in the past 30 days. Almost all participants (91%) knew where to access naloxone, while more than half of the sample reported keeping a personal supply of naloxone (67%). Having experienced a non-fatal overdose (63%), ever witnessing someone else overdose (83%), and having known someone who died from an overdose (91%) were also reported by a

Table 1:

Sample Demographics	Total (N=105)	% / (S.D)
<b>Age</b>	40.8	(+/- 9.5)
<b>Gender</b>		
Female	47	45%
Male	58	55%
<b>Heterosexual Orientation</b>		
No	18	17%
Yes	87	83%
<b>Ethnicity</b>		
Non-white	23	21%
White	82	78%
<b>Currently married/living with partner</b>		
No	78	74%
Yes	27	26%
<b>High school graduate</b>		
No	31	30%
Yes	74	70%
<b>Income Level</b>		
<\$10,000	77	73%
≥\$10,000	28	27%
<b>Homeless in past year</b>		
No	49	47%
Yes	56	53%
<b>Alcohol Use Disorder</b>		
No	65	62%
Yes	40	38%
<b>Moderate/Severe Depression</b>		
No	23	22%
Yes	82	78%
<b>Methadone Dose</b>	84.6	(+/- 31.4)
<b>Visited primary care physician in past year</b>		
No	13	12%
Yes	92	88%

Table 2:

Drug Use Characteristics	Total (N=105)	%
<b>Heroin use in past 30 days</b>		
No	16	15%
Yes	89	85%
<b>Inject Daily in past 30 days</b>		
No	85	81%
Yes	20	19%
<b>Polysubstance Use in past 30 days</b>		
No	16	15%
Yes	89	85%
<b>Overdose (OD) and OD Prevention Characteristics</b>		
<b>Experienced overdose in past 12 months</b>		
No	84	80%
Yes	21	20%
<b>Ever experienced overdose</b>		
No	39	37%
Yes	66	63%
<b>Ever witnessed someone else overdose</b>		
No	18	17%
Yes	87	83%
<b>Ever known someone who had died from an overdose</b>		
No	9	9%
Yes	96	91%
<b>Keep personal supply of Narcan</b>		
No	35	33%
Yes	70	67%
<b>Knowledge of where to access Narcan</b>		
No	9	9%
Yes	96	91%
<b>Fentanyl Contamination Characteristics</b>		
<b>Concerned about fentanyl contamination</b>		
No	32	30%
Yes	73	70%
<b>Perceived past fentanyl contamination</b>		
No	24	23%
Yes	81	77%
<b>Intentional fentanyl use in past 30 days</b>		
No	81	78%
Yes	24	22%
<b>Want to know if drugs contain fentanyl</b>		
No	24	23%
Yes	81	77%
<b>Prior knowledge of fentanyl test strips</b>		
No	56	53%
Yes	49	47%

<b>Knowledge of where to buy fentanyl test strips</b>		
No	74	70%
Yes	31	30%
<b>Ever used fentanyl test strips</b>		
No	87	83%
Yes	18	17%
<b>Have a supply of fentanyl test strips</b>		
No	90	86%
Yes	15	14%
<b>Willingness to use fentanyl test strips</b>		
No	16	15%
Yes	89	85%

Table 3:

Intentional Fentanyl Use (ever) Characteristics	Total (N=46)	%
<b>Primary Route of Fentanyl Use</b>		
Injection	31	67%
Non-Injection	13	28%
Don't Know	2	4%
<b>Frequency of Fentanyl Use</b>		
Once	18	39%
2-4 times per month	14	30%
4-6 times per month	4	9%
Daily	4	9%
2-3 times per day	1	2%
4+ times per day	3	7%
Don't Know	2	4%
<b>Fentanyl Source</b>		
Street	37	80%
Friends/Family	5	11%
Other/Don't know	4	9%

majority of participants.

Most of the sample reported being concerned about fentanyl in their drug supply (70%) and having assumed that their prior drug supplies contained fentanyl (77%), yet only 47% of participants were aware of FTS prior to the study. While we observed a high percentage (85%) of participants willing to use FTS, only 30% of participants knew where to access FTS and only 17% reported ever using FTS. Almost half of our sample (43%) reported ever intentionally using fentanyl; however, a majority (78%) of those participants reported intentionally using fentanyl a few times a month, compared to a small percentage (18%) who used it daily. Most of these participants reported injection as the primary route of fentanyl use (67%) and that the fentanyl was usually obtained from buying it off the street (80%). No statistical differences were observed across demographic variables, clinical identifiers, intentional fentanyl use, and willingness to use FTS.

## Discussion

While polysubstance use, including intentional fentanyl use, and

rates of overdose have been well-documented in people on MOUD [16-18], this study was novel in finding a high willingness (85%) to use FTS among this population. A large percentage of participants in this study had either witnessed, known someone, or overdosed themselves; however, a much lower percentage reported knowledge about FTS or knowing where to access them. In contrast, almost all participants knew how to access naloxone to aid in reversing an overdose. Most states in the United States have some form of established program for at-risk populations to access naloxone [24,25], which is often implemented under the umbrella of syringe services programs (SSP). The Centers for Disease Control and Prevention (CDC) only recently announced that federal funds may be used to purchase and supply FTS [26] in settings such as SSP's. A recent study reported the feasibility of FTS administration at SSP's in Delaware and Maryland [8], highlighting the potential of integrating FTS services in established harm reduction settings to reduce the incidence of fentanyl-related overdoses. Greater efforts are now required to appropriately support FTS administration in SSP's and drug treatment settings.

Further, non-fatal overdoses occur in 10-25% of opioid users annually [27-30]. From 2018-2019 alone, fentanyl-related overdoses increased by over 15% [21]. The rate of intentional fentanyl use among our sample (43%) was alarming, as synthetic opioids have been a key contributor to the rise in opioid-related overdoses [2]. Use of naloxone, such as Narcan, is a highly beneficial tertiary solution when needed and can be credited for saving many lives. However, recovery after a nonfatal overdose is complex, as there can be many detrimental impacts on health after an overdose. In fact, nonfatal overdoses are among the strongest predictors of future fatal overdoses, and individuals are more likely to have a fatal overdose after recovery [31,32]. FTS can serve as a primary means to decrease the likelihood of overdose before it happens, thus reducing the consequences of overdose including stroke, neurological impairment, and death [32]. Additionally, we recommend combining public health efforts and behavior change campaigns, such as the "Never Use Alone" campaign [33] that allows users to call/text a hotline for an anonymous volunteer to call emergency services if a person is unresponsive after using substances that may contain fentanyl.

Our results are consistent with previous literature surveying willingness to use FTS among a similar population of individuals with OUD in New England, where 90% of participants from two studies reported willingness to use FTS, and 98% reported high self-efficacy in using FTS [11,12]. While willingness to use FTS was high among our sample, the low rates of having ever used FTS and lack of knowledge about FTS accessibility highlight the need for additional efforts to bolster FTS knowledge and uptake. Factors that have been associated with greater willingness to use FTS in prior research included being female, older than 35 years of age, homelessness, non-white, witnessing at least one fatal overdose, and suspecting recent fentanyl exposure [14,15]. However, our study did not find any significant factors associated with greater willingness to use FTS among our sample population when explored in data analysis.

We should note some limitations of the current study. One limitation of this research is with regard to our sample. Our results are limited to individuals who are enrolled in MOUD programs, impacting the external validity to compare results to a general

population of individuals with OUD who are not in treatment programs. However, use of MOUD is higher in the northeast than other parts of the United States [20], indicating a need for research for this population. The sample size of 105 participants may also impact generalizability and may explain the lack of statistical significance between groups in our analysis. Additionally, 78% of the sample identified as White, leading to a lack of generalizability to minority populations with OUD (such as Latinx and Black/African Americans). Nonetheless, the sample was well-representative of the demographic breakdown of the established and largest drug treatment program in the state of Connecticut. Future work with diverse populations with OUD would be beneficial and could aim to address whether FTS could be more widely accepted and utilized.

## Conclusions

Synthetic opioid overdoses have dramatically increased the rates of fatality among individuals with opioid dependence [2]. Nonfatal overdoses also have serious health consequences after recovery such as peripheral neuropathy, temporary limb paralysis, and chest infections [32]. Therefore, providing this vulnerable population with a straightforward alternative to prevent the risk of overdose would be crucial for their long-term safety and health, as well as community health. With the well-established infrastructure of drug treatment programs and SSP's, it would seem feasible to implement primary prevention approaches aimed at improving FTS knowledge and use among patients in these settings. This could help to increase engagement in safer drug use behavior among persons on MOUD, leading to overdose reductions among this population. Our study showed a high willingness to use FTS, even among individuals on MOUD who intentionally used fentanyl but who also wanted to reduce risk of overdose.

## Declarations

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The study protocol was approved by the Institutional Review Board at the University of Connecticut and received board approval from the APT Foundation, Inc. methadone maintenance program in New Haven, CT. All participants signed informed consent before engaging in any research procedures.

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Colleen Mistler, Roman Shrestha, and Michael Copenhaver. The first draft of the manuscript was written by Colleen Mistler and all authors commented on previous versions of the manuscript. All authors read



and approved the final manuscript.

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