Journal of Substance Abuse Treatment 86 (2018) 65–69

Contents lists available at ScienceDirect

Journal of Substance Abuse Treatment

Expected and actual fentanyl exposure among persons seeking opioid withdrawal management☆

Shannon R. Kenney [a,b,*], Bradley J. Anderson [a], Micah T. Conti [a,c], Genie L. Bailey [b,c], Michael D. Stein [a,d]

[a] Behavioral Medicine Department, Butler Hospital, Providence, RI 02906, United States
[b] Warren Alpert Medical School of Brown University, Providence, RI 02912, United States
[c] Stanley Street Treatment and Resources, Inc., Fall River, MA 02720, United States
[d] Boston University School of Public Health, Boston, MA 02118, United States

ARTICLE INFO

Article history:
Received 14 November 2017
Received in revised form 3 January 2018
Accepted 3 January 2018

Keywords:
Opioids
Heroin
Fentanyl exposure
Risk perceptions
Treatment

ABSTRACT

Objective: Fentanyl-contaminated opioid supplies have led to rising overdose fatalities in recent years. We compared beliefs, behaviors, and risk perceptions related to fentanyl with actual toxicology reports among people who used opioids.
Method: Participants ($n = 231$) were patients undergoing short-term inpatient opioid withdrawal management in Fall River, Massachusetts. We compared persons testing positive and negative for fentanyl on urine toxicological testing at program entry.
Results: Nearly all (95.7%) participants believed that fentanyl increases risk for overdose/death, and 86.6% of participants tested positive for fentanyl. Positive fentanyl toxicology test results were associated with lower educational attainment, history of injection drug use, and self-reported lifetime use of fentanyl. Of those reporting they had never been exposed to fentanyl (intentionally or unintentionally) ($n = 33$), two-thirds tested positive for fentanyl; among those believing their tests would be negative ($n = 49$), 71.4% tested positive for fentanyl. Heroin use was associated with fentanyl exposure; persons who reported past month heroin use ($n = 213$) were more likely to test positive for fentanyl (91.1%) than persons using non-heroin opioids ($n = 18$; 33.3%).
Conclusions: Nearly nine in ten participants tested positive for fentanyl, including participants who anticipated their tests would be negative. Leveraging toxicology results in opioid withdrawal settings may be helpful in educating patients about fentanyl exposure and risks.

1. Introduction

From 2002 to 2015 there was a 2.8 fold increase in opioid overdose fatalities nationally (National Institute on Drug Abuse, 2017). Although U.S. overdose deaths attributed to prescription opioid pain relievers have remained fairly steady since 2010 (National Institute on Drug Abuse, 2017), heroin-related overdose fatalities tripled from 2010 to 2014 (Rudd, Seth, David, & Scholl, 2016). Since 2013, an increasing proportion of these fatalities are attributed to illicitly manufactured fentanyl, a synthetic mu-opioid receptor agonist 30–50 times more powerful than heroin per mg. (Ciccarone, Ondocsin, & Mars, 2017) that has infiltrated the U.S. heroin supply (Gladden, Martinez, & Seth, 2016; Warner, Trinidad, Bastian, Minino, & Hedegaard, 2016). Fentanyl-contaminated overdose is a particularly significant public health crisis in Massachusetts, where opioid death rates tripled from just 2010 to 2015 and, in the six months of 2016, 74% of available opioid overdose toxicology reports tested positive for fentanyl (Massachusetts Department of Public Health, 2017).

Recent studies demonstrate high prevalence rates of fentanyl in persons who use opioids. Canadian studies report a 14% fentanyl prevalence rate among persons who use illicit drugs (Hayashi et al., 2018) and a 29% prevalence rate among clients seeking harm reduction services (Amlani et al., 2015). In 368 clients undergoing methadone maintenance therapy (MMT) for heroin addiction in Michigan, 38% tested positive for fentanyl at least once during treatment (Arfken, Suchanek, & Greenwald, 2017); these authors anecdotally reported that clients were "surprised and stunned" to learn of their fentanyl-positive results. Fentanyl-exposed persons are more likely to report multiple MMT admissions, leaving treatment sooner, injection drug use (IDU), and using heroin or cocaine (Arfken et al., 2017; Hayashi et al., 2018). Suspected fentanyl exposure is associated with past or current opioid agonist therapy (OAT), history of overdose, and regular IDU, heroin use or cocaine use (Carroll, Marshall, Rich, & Green, 2017). Still, no

☆ This study was funded by the National Institute on Drug Abuse (RO1 DA034261). Trial registered at clinicaltrials.gov; Clinical Trial # NCT01751789.
* Corresponding author at: Department of Psychiatry and Human Behavior, Brown University, Butler Hospital, 345 Blackstone Blvd., Providence, RI 02906, United States.
E-mail address: Shannon_Kenney@brown.edu (S.R. Kenney).

https://doi.org/10.1016/j.jsat.2018.01.005
0740-5472/

study to date has examined expected fentanyl exposure and other predictors of positive urine toxicology screens in an opioid dependent population.

Qualitative research supports that people who use heroin acknowledge fentanyl contaminated heroin supply chains (Ciccarone et al., 2017; Somerville et al., 2017), and many consider fentanyl "ubiquitous and unavoidable" (Ciccarone et al., 2017). Macmadu, Carroll, Hadland, Green, and Marshall (2017) found that 59% of people who reported suspected fentanyl exposure in their heroin were not aware their heroin had been adulterated prior to use (Macmadu et al., 2017). In addition to gaining a better understanding about how people's perceptions of fentanyl risk impact their exposure to fentanyl, there is a need to acknowledge that some users may seek out fentanyl. While some studies show that people who use heroin try to avoid fentanyl (Carroll et al., 2017), other studies find that many people use fentanyl-adulterated heroin intentionally (Ciccarone et al., 2017; Macmadu et al., 2017). In fact, a Massachusetts-based qualitative study found that the fentanyl epidemic did not alter opioid use behaviors (Somerville et al., 2017).

1.1. Study aims and hypotheses

In the current study, we advance knowledge about this urgent public health crisis by testing the relationship between beliefs about fentanyl exposure and actual toxicology reports in people seeking opioid withdrawal management. By assessing participants' self-reported fentanyl use, perceptions about fentanyl-related exposure risk, and other predictors of fentanyl exposure these findings can inform potential directions for clinical practice, education, and intervention.

Although we expected that intentional use of fentanyl and anticipated fentanyl exposure would be associated with greater confirmed positive fentanyl reports, given the increased pervasiveness of fentanyl nationally, we hypothesized that a substantial proportion of respondents anticipating no fentanyl exposure would test positive for fentanyl. Based on national data showing that non-Hispanic white men aged 15–44 are at greatest risk for dying from illicitly manufactured fentanyl (Gladden et al., 2016), we hypothesized that males and Whites would be most likely to test positive for fentanyl. Also grounded in existing research, we expected heroin use, IDU, cocaine use, overdose history, and history of OAT to be associated with fentanyl exposure.

2. Method

2.1. Recruitment

Between April and September 2017, persons seeking inpatient opioid withdrawal management at Stanley Street Treatment and Resources, Inc. (SSTAR) in Fall River, Massachusetts were asked to participate in a survey research study. SSTAR's opioid withdrawal program provides evaluation and withdrawal management using a methadone taper protocol, individual and group counseling, and aftercare case management. Patients admitted stay an average of 4.9 days.

Of patients admitted to SSTAR during the recruitment period for opioid misuse, 251 met the study's eligibility criteria (18 years or older, English-speaking, and able to provide informed consent) as approved by the Butler Hospital Institutional Review Board. Twenty persons refused study participation or were discharged before staff could interview them. The remaining 231 persons completed a non-incentivized, face-to-face interview administered by non-treating research staff over the course of approximately 15 min. All participants had urine drug testing for fentanyl and its major metabolite, norfentanyl. Participants were unaware of test results at the time of the interview. Commercial labs test for norfentanyl because fentanyl is metabolized to norfentanyl, which may be detected at concentrations 3–4 times higher than that of fentanyl (Poklis & Backer, 2004).

2.2. Measures

In addition to age, sex, race/ethnicity, years of education, and history of IDU the following variables were assessed.

2.2.1. Heroin use

Respondents were asked how many days in the past 30 days they used heroin.

2.2.2. History of overdose

Respondents were asked if they had ever overdosed. We defined overdose (on any drug) as "you were unarousable (couldn't be woken) with shaking or calling your name because of the drugs you consumed."

2.2.3. Prior opiate agonist therapy

Respondents responded "yes" or "no" to ever having been prescribed buprenorphine or enrolled in a methadone maintenance program. Each type of OAT was summarized (e.g., "Methadone is a medication-assisted treatment for opioid dependence. Patients typically attend methadone clinics on a daily basis to receive their dose of methadone").

2.2.4. Ever been given naloxone

Respondents answered "yes" or "no" to ever received or been given naloxone (Narcan)—defined as the "overdose antidote"—because of an overdose.

2.2.5. Fentanyl use

Respondents were asked if they had ever "intentionally, knowingly used fentanyl to get high" and were provided with five answer options. Those answering "no" were coded a never having used fentanyl; those answering "I used fentanyl but it wasn't intentional (e.g., found out afterwards)" were coded as unintentional fentanyl users; and those responding "Yes, I used it intentionally nasally," "Yes, I used it intentionally and injected," or "Yes, I used it intentionally in some other form" were coded as ever intentionally using fentanyl.

2.2.6. Perceived overdose risk of fentanyl

Respondents were asked, "Do you think fentanyl increases risk for overdose?" Answer options included "Yes," "No," and "I don't know." Missing ($n = 1$) and refusals ($n = 2$) were excluded from analyses.

2.2.7. Anticipated fentanyl exposure

Respondents were asked, "Do you think your tox screen when you arrived at SSTAR had fentanyl in it?" Answer options included "Yes," "No," and "I don't know." Missing ($n = 1$) and refusals ($n = 2$) were excluded from analyses.

2.2.8. Confirming fentanyl exposure

Enzyme immunoassay testing was performed (Olympus AU640) with confirmatory testing among those initially positive (Triple Quad LCMSMS) at the cutoff for fentanyl set at 2.5 ng/ml and at 5 ng/ml for norfentanyl. Detection time for heroin in urine is 1–3 days and for norfentanyl/fentanyl is 1–2 days following last use.

2.2.9. Additional urine drug testing

Enzyme immunoassay testing was also performed for amphetamines, barbiturates, benzodiazepines, cocaine, and non-heroin opioids (i.e., methadone, morphine, hydromorphone, codeine, hydrocodone, oxycodone).

2.3. Analysis plan

We present descriptive statistics to summarize the characteristics of the sample. We used *t*-tests to compare persons testing positive and negative for fentanyl for differences in means, and Pearson χ^2-tests to