

HHE 2018-0083

Evaluation of Potential Occupational Exposures to Opioid Drugs During a Law Enforcement and
Emergency Medical Services Response

Interim Report
April 20, 2018

Sophia Chiu, MD, MPH
Jennifer Hornsby-Myers, MS, CIH
Douglas Trout, MD, MHS

Introduction

The NIOSH Health Hazard Evaluation program received requests for an evaluation from a county's Fire Chief and Sheriff. The requests concerned possible work-related exposure to opioid drugs (including fentanyl or its analogues) among responders during the course of a law enforcement and fire and rescue response. On March 1–2, 2018, Deputy Sheriffs and fire fighter-emergency medical service (EMS) providers responded to a private residence where a drug overdose had taken place. Deputy Sheriffs and fire fighter-EMS providers developed symptoms during the response. A total of nine responders were evaluated at a local hospital. We visited the Fire and Rescue Department, Sheriff's Office, and hospital on March 13–14, 2018. On March 16, 2018, we sent an interim letter to the requestors and employee representatives briefly summarizing our activities and preliminary findings. This interim report summarizes current findings and recommendations for this evaluation.

At the time of the evaluation, the Fire and Rescue Department had 131 full-time career fire fighter-EMS providers operating from 13 stations. The department also included approximately 200 active volunteer fire fighter-EMS providers operating via 14 volunteer fire/rescue or EMS squads. Daily staffing for the department included six paramedic transport units (ambulances) and four fire suppression units (engines), along with various other support equipment. Fire fighter-EMS providers worked in 24-hour shifts on days 1, 3, and 5 of a 9 day-day cycle and were off on days 2, 4, and 6–9 of the cycle. The Sheriff's Office included a Field Operations Division with 114 assigned deputies. Deputies were assigned to one of three overlapping 11.5-hour shifts (day, evening, or midnight).

In the recent past, both the Fire and Rescue Department and Sheriff's Office had received an increased volume of calls related to drug overdoses. This trend is consistent with the increased number of overdose fatalities related to fentanyl, fentanyl analogues, and other illicit drugs nationally [CDC 2018]. The Fire and Rescue Department responded to over 170 calls related to opioid use in 2017. Among those responses, over 120 different victims received naloxone as part of the response.



Centers for Disease Control
and Prevention
National Institute for Occupational
Safety and Health

Methods

The objectives of our evaluation were to:

1. Review activities of the responders (fire fighter-EMS providers and Deputy Sheriffs) during the March 1–2, 2018 response to characterize potential exposure to opioid drugs.
2. Review information concerning any health effects experienced by the responders who underwent medical evaluation, including information from available medical records.
3. Make recommendations on how to prevent exposures to opioid drugs among responders.

We conducted voluntary, confidential interviews with six fire fighter-EMS providers and three Deputy Sheriffs who underwent medical evaluation immediately after the March 1–2, 2018 response. During the interviews, we discussed the response, work history and practices, training, personal protective equipment (PPE) use, and any health effects experienced around the time of the response.

We spoke with emergency department staff who coordinated decontamination procedures at the hospital and attended to the overdose victims and responders. Specifically, we spoke with one of two treating physicians and nursing staff. We also reviewed the medical records related to the response for all nine responders who were evaluated at the hospital.

In addition, we discussed the response, departmental policies and procedures, and call volume with three members of the Fire and Rescue Department command staff. We reviewed the narratives from the Sheriff's Office and the Fire and Rescue Department for the response. We discussed emergency dispatcher procedures for potential overdoses with a member of the county emergency communications center.

Results

Summary of Events of the March 2018 Response

The following summary of the response is based on the interviews we conducted and review of records. On the evening of March 1, 2018, Deputy Sheriffs and fire fighter-EMS providers were dispatched for a reported drug overdose at a private residence. The initial responder on the scene was a Deputy Sheriff (Deputy Sheriff 1), who was directed to a bathroom where a male (Victim 1) was unresponsive in the shower area. Victim 1 was wet as the result of attempted revival by other civilian bystanders on the scene. With the assistance of a civilian, Deputy Sheriff 1 moved Victim 1 to the floor of a nearby bedroom. Victim 1 was described as having a pulse with “inconsistent” breathing (respirations reportedly only occurred every 15–20 seconds). Victim 1 was also described as cyanotic. Deputy Sheriff 1 administered intranasal naloxone and performed sternal rubs on Victim 1 with no response.

Fire fighter-EMS providers arrived soon after and took charge of resuscitation efforts. Life support measures performed for Victim 1 included ventilation via a nasal airway and bag-valve mask and obtaining intravenous access. In total, Victim 1 received 10 milligrams of intranasal

Page 3 – HHE 2018-0083 Interim Report

and intravenous naloxone. Victim 1 was transported using a portable flexible stretcher to the ambulance and then to the emergency department. Victim 1 became responsive and began breathing on his own during transport to the emergency department. A fire engine at the scene of the response and a Deputy Sheriff also proceeded to the emergency department. As the ambulance was on its way to the emergency department, a report was provided to the emergency department that a fire fighter-EMS provider (FF-EMS 1) was symptomatic; the health effects are described below.

Two Deputy Sheriffs developed symptoms at the scene of the response (described below) and were transported to the emergency department. Nine responders who went to the hospital were met outside the emergency department in the hospital's decontamination area. All nine responders who went to the hospital underwent the decontamination procedures set up by the hospital, which included removal of clothes, showering, and re-clothing with a disposable hospital gown. The responders were then observed within the emergency department.

The scene of the response was described as a private residence. No powders suspected to be opioid drugs were observed on Victim 1 during the resuscitation efforts. An unspecified amount of a "white powdery substance" and a "plunger to a needle" were found in a nightstand drawer in the bedroom where Victim 1 was resuscitated. There were no reports that this substance was disturbed during the response. Several responders and hospital staff reported civilians present on the scene provided various information about possible substances being used at the residence.¹ Some responders reported a slight haze in the residence; some responders thought it was related to tobacco or marijuana smoke. Information from the interviews and records reviewed were not clear on whether any materials from the scene were sent for forensic analysis in a laboratory.

There were approximately six or seven other civilians at the scene. All were thought by responders to have been under the influence of unknown substances, in part due to their semi-responsive states. Two other civilians (Victims 2 and 3), who at various times during the incident may have been indoors or outdoors, were subsequently transported to the emergency department for care. Law enforcement personnel administered naloxone to one of these civilians on the scene due to signs of opioid toxicity; it was reported that the civilian's status was improved after naloxone administration.

Summary of Responders' Job Tasks and Symptoms during the Response

¹ Information reported concerning possible substances being used at the residence included: (a) the activity was a "pill party;" (b) participants were "doing roxy;" and (c) participants were "snorting oxycontin." There was no confirmation of any information concerning forms or formulations of any of the substances potentially used at the scene.

Page 4 – HHE 2018-0083 Interim Report

Of the nine responders who were evaluated at the emergency department, six were the first fire fighter-EMS providers on the scene, and three were the initial Deputy Sheriffs on the scene. There were other fire fighter-EMS and law enforcement personnel on the scene at the residence during the response, but they were not evaluated at the emergency department and were not part of this evaluation. All nine responders reported that their routine duties included periodic responses to overdose scenes in the community. Although responses to overdose incidents were reported to sometimes occur in clusters, they reported responding to approximately two to three overdose incidents per month.

FF-EMS 1, 2, and 3 were three of the four responders who provided the most direct care to Victim 1 (e.g., managing the airway, establishing intravenous access). Several responders helped lift Victim 1 from the floor using a flexible stretcher and moved Victim 1 into the ambulance. Deputy Sheriff 1 had assisted in moving Victim 1 out of the shower with ungloved hands. After donning gloves, Deputy Sheriff 1 administered the first dose of naloxone to Victim 1. All other interviewed responders reported wearing gloves throughout the response. Deputy Sheriff 1 subsequently performed other routine duties as part of the response. The other Deputy Sheriffs had no direct contact with Victim 1; their activities on the scene included other duties for this type of response.

During the response, all interviewed responders reported wearing their usual uniform, which consisted of a long-sleeve garment. The responders reported changing gloves at varying intervals during the response. All nine responders who underwent medical evaluation reported being at their baseline level of health prior to the response. In our interviews, two responders staffing the ambulance (FF-EMS 1 and 2) and one from the fire engine (FF-EMS 3) reported symptoms during the response. Of the three other fire fighter-EMS providers from the engine (FF-EMS 4, 5, and 6), two reported mild symptoms during the evaluation at the emergency department, and one reported no symptoms. Table 1 summarizes the response activities and reported symptoms. Approximate duration of the symptoms is reported in Table 1; in general, most of the symptoms resolved after several hours, with one responder's symptoms lasting less than an hour.

Table 1. Activities and symptoms reported by responders during interviews and medical records (n = 9)

Responder	Activities	Symptoms reported during interview or in medical records	Symptom onset location	Time to onset* (minutes)	Approximate duration of symptoms (hours)
FF-EMS 1	Provided patient care to Victim 1	Palpitations, numb feeling in lips and fingertips, mental confusion, weakness, headache, nausea	Outside the residence, as Victim 1 was being loaded on ambulance	10–15	2–3
FF-EMS 2	Provided patient care to Victim 1	Lightheadedness, mental confusion	Hospital, upon arrival	20	Several
FF-EMS 3	Provided patient care to Victim 1	Palpitations, weakness, nausea, stomach discomfort	Hospital, decontamination area	20	3
FF-EMS 4	No direct contact with Victim 1; various response activities inside and outside	Mild weakness	Uncertain; symptoms resolved prior to arrival at hospital	10–15	10–15 minutes
FF-EMS 5	Brief direct contact with Victim 1 – helped initiate care; various response activities inside and outside	No symptoms	N/A	N/A	N/A
FF-EMS 6	Assisted with care of Victim 1 in residence and ambulance	Lightheadedness, “just feel off”	Prior to arrival at hospital	20–30	1.5
Deputy Sheriff 1	Moved Victim 1 to bedroom without gloves, administered naloxone and sternal rubs to Victim 1	Lightheadedness, nausea, weakness	Inside the residence	5	1.5
Deputy Sheriff 2	Law enforcement activities inside and outside; no direct contact with Victim 1	Headache, double vision, “altered feeling,” palpitations	En route to hospital	20–30	4–5
Deputy Sheriff 3	Law enforcement activities inside and outside; no direct contact with Victim 1; direct contact with other civilians on scene	Lightheadedness, palpitations, mild chest discomfort, lower leg numbness, headache	Outside the residence	10–15	Several

N/A = not applicable

* Approximate time from arrival on scene to symptom onset (minutes)

Page 6 – HHE 2018-0083 Interim Report

Figure 1 summarizes the symptoms experienced by the nine responders as documented in the medical records and from our interviews. The symptoms in the medical records were generally consistent with what hospital staff and responders reported to us during interviews. Several responders were noted by emergency department staff to be objectively flushed and uncomfortable upon presentation. Eight of the nine responders evaluated in the emergency department had one or more symptoms documented in the emergency department medical records.

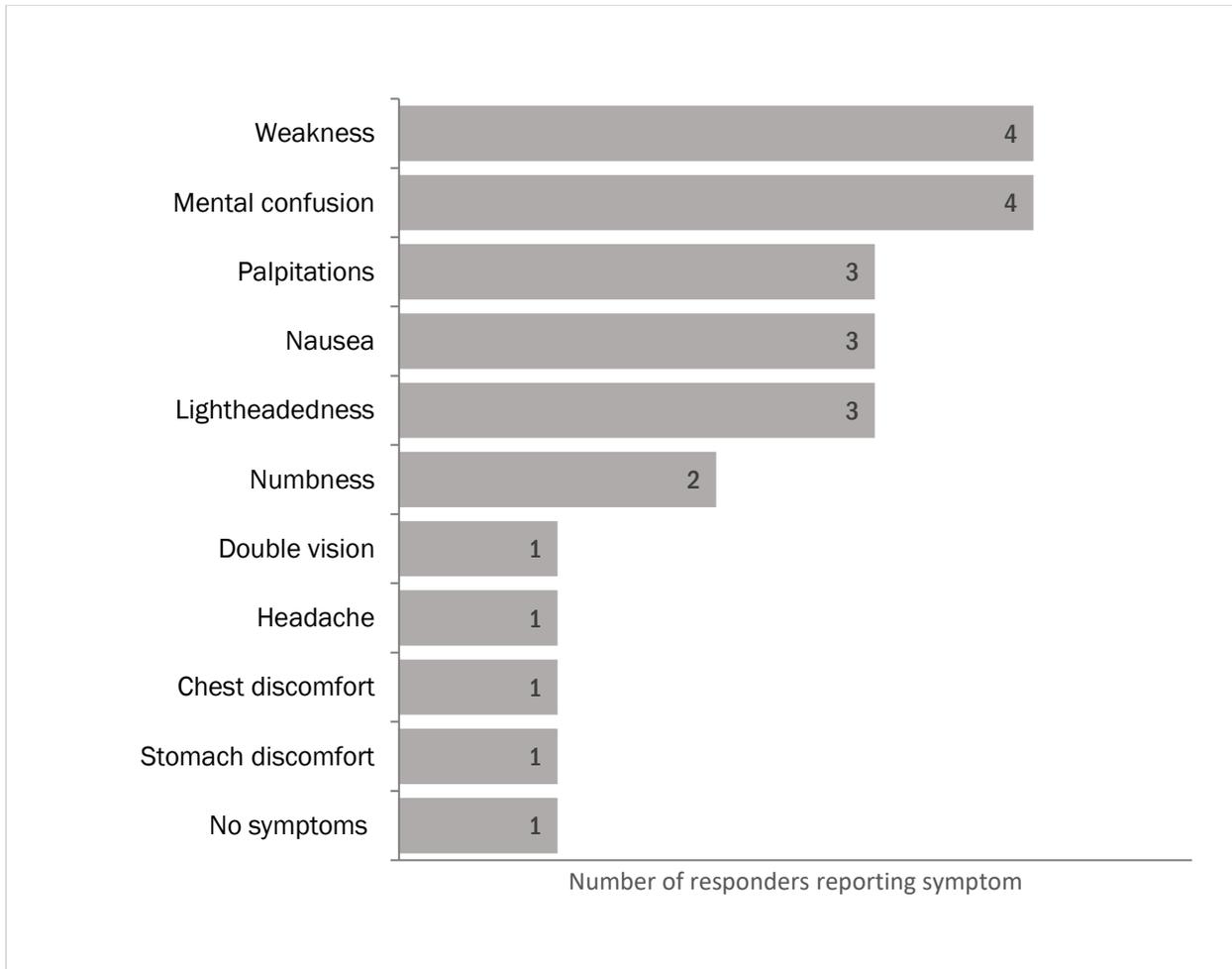


Figure 1. Symptoms reported by responders in the emergency room medical records and interviews (n = 9). Mental confusion includes symptoms of 'feeling off' and 'altered feeling.'

Alt text: Bar graph showing the number of responders reporting a symptom. Weakness and mental confusion were the most commonly reported symptom. One responder reported no symptoms.

The primary healthcare performed in the emergency department for the responders included monitoring of vital signs and observation. Responders had normal temperature and heart rate, normal to elevated blood pressure, and normal to elevated respiratory rate during the course of

observation in the emergency department. Pupils were noted to be dilated in one responder, and the eye examination was documented as “normal [to] inspection” in two responders. However, actual pupil size was not documented for any of the responders. Hospital staff indicated that the responders were all ‘clinically stable’ during the observation periods and the mild elevations in blood pressure and respiratory rate mentioned above were not thought to be unusual. One responder had a urine drug screen performed; the screen was negative for seven drugs. All responders’ symptoms improved over the time of evaluation in the emergency department. One responder received acetaminophen and an anti-nausea medication; the other responders were observed. The clinical impressions of the emergency department physicians for the responders included two with “chemical exposure” and seven with “accidental overdose (opiate, possible occupational exposure)” or impressions with very similar wording.

Emergency department staff coordinated the decontamination process for all responders and the three victims who presented to the hospital. No drugs or visible contaminants were noted by hospital staff on the responders or the three victims presenting to the emergency department. Decontamination was performed in the hospital’s decontamination rooms, which were readily accessible from the ambulance entry area and adjacent to the emergency department.

Summary of Other Interviews

We also had brief discussions concerning emergency dispatch procedures with a member of the county emergency communications center and a member of the Fire and Rescue Department command staff. During these discussions, we learned some details concerning the standard information that emergency dispatchers would collect from callers and convey to responders during an incident. For example, emergency dispatchers use various cue cards to prompt callers for more information. The cue card for overdose/poisoning includes prompts to ask whether the overdose victim is alert, breathing normally, changing color, and violent. The cue card also prompts dispatchers to ask callers what the overdose victim might have taken. In addition to giving a verbal account of the call to responders, dispatchers enter information from the call into an electronic record that fire fighter-EMS providers can access from their vehicles.

Discussion

From 2015 to 2016, there was a 100% increase in the rate of overdose deaths involving synthetic opioids (which includes fentanyl and its analogues) in the United States [CDC 2018]. This has raised concerns about the potential for exposure to opioid drugs among emergency responders, who might come into contact with those substances in the course of their work. In this evaluation, which began 12 days after the response, we collected information from interviews with the affected first responders, interviews with the involved healthcare personnel, and review of available records.

Issues Related to Potential Exposures to Responders

In general, inhalation, mucous membrane contact, ingestion, and percutaneous exposure (e.g., needlestick) are potential work-related routes of exposure to opioid drugs among responders. Brief skin contact by itself with small amounts of fentanyl or its analogues is not expected to cause symptoms [Lynch 2018; Moss et al. 2017; NIOSH 2017], but possible subsequent hand-to-face contact could be a possible route of exposure.

The information reviewed suggested Victim 1 experienced life-threatening opioid toxicity (overdose) in the residence. Responders reported that they determined that the clinical condition of Victim 1 was consistent with opioid overdose, and Victim 1 had an apparent positive clinical response to naloxone administration. Naloxone was reportedly administered to one other civilian during the incident, also with a positive clinical response. The emergency responders and hospital staff we interviewed reported no powder suspected to be opioids on the victims. The Sheriff's Office narrative noted the presence of a white powdery substance in the bedroom where Victim 1 was resuscitated.

We cannot rule out several possible exposure scenarios or the possibility that more than one work-related factor may be associated with the observed symptoms among the symptomatic responders. For example, a small amount of opioids might have been present at the residence and been transferred to the responders' mucosal membranes (nose or mouth) or eyes through inadvertent hand or glove contact. A slight haze in the residence was noted by several responders; we have no information on the source of the reported haze.

Issues Related to Health Effects

Eight responders reported a range of symptoms during various time points during the emergency response and evaluation at the hospital. None of the symptomatic responders had the classic signs of life-threatening opioid toxicity. These classic signs include lethargy or other indications of central nervous system depression; shallow, slow, or absent breathing; and miosis (small or "pinpoint" pupils) [Boyer 2012; Ropper et al. 2014]. Additionally, there were no findings in the clinical evaluations that were consistent with severe opioid toxicity. Symptoms of mild opioid toxicity (compared to severe toxicity that includes respiratory depression) might include symptoms such as nausea and lightheadedness [Lynch et al. 2018]. A number of non-specific symptoms which could be consistent with mild opioid toxicity were reported by the responders. The clinical impressions from the emergency department physicians included "chemical exposure" and "accidental overdose (opiate, possible occupational exposure)."

Conclusions

During a response in March 2018, Deputy Sheriffs and fire fighter-EMS providers developed health effects shortly after treating or transporting a victim with suspected opioid overdose. The etiology of symptoms and potential source(s) of exposure for the workers could not be definitively identified. None of the responders' health effects involved classic, life-threatening opioid toxicity. A mild degree of opioid toxicity can cause symptoms similar to some of the non-specific symptoms reported by responders in this response.

Recommendations are provided below. Training and education to improve understanding of the routes of exposure to opioid and other drugs likely to cause symptoms and measures to protect against work-related exposure to opioids and other drugs can help prevent exposures and prevent health effects among Sheriff's Office and Fire and Rescue Department employees.

Further evaluations and research are needed to improve understanding of the routes of exposure and potential health effects among first responders potentially exposed to opioid drugs (including fentanyl and fentanyl analogues) in the course of their work.

Recommendations

NIOSH has issued interim guidance on how to protect emergency responders from exposures to fentanyl and its analogues [NIOSH 2017]. We believe that the current NIOSH guidance is applicable to this evaluation, even though whether fentanyl or fentanyl analogues were involved in this response cannot be confirmed with the available evidence. On the basis of our findings, we recommend the actions listed below.

We encourage the Sheriff's Office and the Fire and Rescue Department to use labor-management health and safety committees or working groups to discuss our recommendations and develop an action plan. Those involved in the work can best set priorities and assess the feasibility of our recommendations for the specific situation at the Sheriff's Office and the Fire and Rescue Department.

1. Provide training to all Deputy Sheriffs and firefighter-EMS providers on how to prevent occupational exposure to fentanyl and its analogues, including standard safe operating procedures, training, PPE, and decontamination. These topics are addressed in the NIOSH webpage Topic Page "Fentanyl: Preventing Occupational Exposure to Emergency Responders" (<https://www.cdc.gov/niosh/topics/fentanyl/risk.html>). In addition to established work practices, responders should follow the following recommendations when fentanyl or its analogues are known or suspected to be present:
 - a. Do not eat, drink, smoke, or use the bathroom while working in an area with known or suspected fentanyl.
 - b. Do not touch the eyes, mouth, and nose after touching any surface potentially contaminated with fentanyl.

- c. Avoid performing tasks or operations that may aerosolize fentanyl due to increased exposure risks.
 - d. Change gloves when they become contaminated as soon as practical during response activities; gloves should also be changed periodically during response activities even without evident contamination.
 - e. Wash hands with soap and water immediately after a potential exposure and after leaving a scene where fentanyl is known or suspected to be present to avoid potential exposure and to avoid cross contamination. Do not use hand sanitizers or bleach solutions to clean contaminated skin.
2. Continue to work with the county emergency communications center to identify any possible improvements in a) gathering information about potential overdoses and whether powders suspected to be opioids are on-scene, and b) relaying this information to first responders during dispatch communications. Having this information before arriving at the scene can help first responders anticipate the potential level of exposure and prepare accordingly before conducting their own on-scene risk assessment.
3. Continue to work with local hospitals that receive victims from EMS responses to identify any possible improvements in EMS providers' conveying of information about the emergency response to emergency department staff. Such information should include details related to potential contamination of the victims and providers. Having this information before arrival at the hospital can help healthcare personnel better assess whether decontamination is necessary and coordinate medical evaluation and treatment of potentially multiple victims and responders.
4. Continue to follow NIOSH recommendations for procedures and work practices in work situations where the exposure level to fentanyl or its analogues is anticipated to be "minimal," which is defined as defined a situation where no fentanyl products are visible in the NIOSH webpage noted above.
5. Develop new or modify existing policies or procedures for work situations in which the anticipated exposure level to fentanyl or its analogues is determined to be "moderate" or greater.
 - a. A "moderate" exposure level is defined as a situation where small amounts of fentanyl products are visible.
 - b. Conduct a risk assessment to identify potential hazards related to fentanyl and fentanyl analogues during law enforcement and fire and rescue activities and determine what is appropriate PPE for moderate or high exposures. NIOSH recommendations for these exposure levels are detailed on the NIOSH webpage noted above.
6. Coordinate with local hospitals to ensure that soap and water are available after EMS responses where fentanyl products are known or are suspected to be present for washing skin and decontaminating surfaces and equipment before disinfectants are used.

7. Develop standard procedures for coordination between the Sheriff's Office, Fire and Rescue Department, and other partners such as the regional HAZMAT team, to follow up on forensic testing results of evidence collected during future response activities. If substances are identified as being present at the scene of response activities, that documentation should be placed in the occupational health or personnel records of applicable law enforcement staff and fire fighter-EMS providers.
8. Encourage employees to report possible exposures to and health effects resulting from exposure to opioids to their supervisors. This information, along with information on the identity of the substances from forensic testing, can be periodically reviewed to identify any trends affecting the risk of work-related exposure to opioids and any associated health effects. Use this information to help determine whether changes in current procedures may be needed.

References

- Adams AJ, Banister SD, Irizarry L, Trecki J, Schwartz M, Gerona R [2017]. “Zombie” outbreak caused by the synthetic cannabinoid AMB-FUBINACA in New York. *N Engl J Med* 376(3):235–242, <https://www.sciencedirect.com/science/article/pii/S037907381630055X?via%3Dihub>
- Behrman AD [2008]. Luck of the draw: common adulterants found in illicit drugs. *J Emerg Nurs* 34(1):80–82, <http://dx.doi.org/10.1016/j.jen.2007.10.001>.
- Broséus J, Gentile N, Esseiva P [2016]. The cutting of cocaine and heroin: A critical review. *Forensic Sci Int* 262:73–83, <http://www.nejm.org/doi/10.1056/NEJMoal610300>.
- Boyer EW [2012]. Management of opioid analgesic overdose. *N Engl J Med* 367(2):146–155, <http://dx.doi.org/10.1056/NEJMra1202561>.
- Centers for Disease Control and Prevention (CDC) [2018]. Overdose deaths involving opioids, cocaine, and psychostimulants – United States, 2015–2016. *MMWR* 67:349–358, <http://dx.doi.org/10.15585/mmwr.mm6712a1>.
- CFR. Code of Federal Regulations. Washington, DC: U.S. Government Printing Office, Office of the Federal Register.
- Cole C, Jones L, McVeigh J, Kicman A, Syed Q, Bellis M [2011]. Adulterants in illicit drugs: a review of empirical evidence. *Drug Testing and Analysis* 3(2):89–96, <http://dx.doi.org/10.1002/dta.220>.
- Lynch MJ, Suyama J, Guyette FX [2018]. Scene safety and force protection in the era of ultra-potent opioids. *Prehospital Emergency Care* 22(2):157–162; <https://doi.org/10.1080/10903127.2017.1367446>.
- Moss MJ, Warrick BJ, Nelson LS, McKay CA, Dubé P-A, Gosselin S, Palmer RB, Stolbach AI [2017]. ACMT and AACT position statement: preventing occupational fentanyl and fentanyl analog exposure to emergency responders. *Clin Toxicol* 56(4): 391–400, <http://dx.doi.org/10.1080/15563650.2017.1373782>.
- NIOSH [2017]. Fentanyl: preventing occupational exposure to emergency responders. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, <https://www.cdc.gov/niosh/topics/fentanyl/risk.html>.
- Ropper AH, Samuels MA, Klein JP, eds. [2014]. *Adams and Victor's principles of neurology*. 10th ed. New York: The McGraw-Hill Companies.
-

Page 13 – HHE 2018-0083 Interim Report

The Health Hazard Evaluation Program investigates possible health hazards in the workplace under the authority of the Occupational Safety and Health Act of 1970 (29 U.S.C. § 669(a)(6)). The Health Hazard Evaluation Program also provides, upon request, technical assistance to federal, state, and local agencies to investigate occupational health hazards and to prevent occupational disease or injury. Regulations guiding the Program can be found in Title 42, Code of Federal Regulations, Part 85; Requests for Health Hazard Evaluations (42 CFR Part 85).

Disclaimer

The recommendations in this report are made on the basis of the findings at the workplace evaluated and may not be applicable to other workplaces.

Mention of any company or product in this report does not constitute endorsement by NIOSH.

Citations to Web sites external to NIOSH do not constitute NIOSH endorsement of the sponsoring organizations or their programs or products. NIOSH is not responsible for the content of these Web sites. All Web addresses referenced in this document were accessible as of the publication date.
