



**BRAIN INJURY  
ASSOCIATION**  
OF AMERICA

# Non-lethal Opioid Overdose and Acquired Brain Injury

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A POSITION STATEMENT OF THE BRAIN INJURY ASSOCIATION OF AMERICA

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# **Non-Lethal Opioid Overdose and Acquired Brain Injury**

## **Introduction**

Numerous articles have been written suggesting that the opioid crisis is a nationwide public health emergency. This epidemic is reportedly the deadliest drug crisis in American history. In fact, opioids are the leading cause of death for Americans under 50 years of age, more than car accidents or guns. Each day we now lose more than 140 Americans to overdoses. Individuals who do not die from an overdose often require rehabilitation from a brain injury service provider. Increasingly providers recognize the need to integrate treatment models for substance use/misuse with brain injury rehabilitation techniques that will result in the highest levels of health, independence and life satisfaction.

The Brain Injury Association of America adopted this position statement in June 2018 to educate the public about the linkage between non-lethal opioid overdose and acquired brain injury.

## **Opioids Defined**

Opioids are a class of drugs that relieve pain by binding with opioid receptors in the nerve cells of the brain and body. This class of drugs includes pain relievers, synthetic opioids such as fentanyl used as anesthesia during surgery, and illicit substances such as heroin. Prescription pain relievers, such as hydrocodone (Vicodin), oxycodone (Oxycontin), morphine, codeine, and others, are used to treat pain caused by injuries, inflammation, medical conditions such as cancer, medical procedures, chronic pain in degenerative conditions, such as rheumatoid arthritis, and for patients receiving palliative care (National Institute on Drug Abuse, 2018). In the short-term, and when used as prescribed, opioids can be a safe and effective component of a pain management strategy (Institute of Medicine, 2011). Opioids, in addition to pain relief, produce a sense of euphoria. Regular use of opioids, even when under the care of a physician, can lead to tolerance and dependence. Because of the euphoria produced by opioids, this class of drugs may be misused or abused, and can result in lethal and non-lethal overdoses (NADA, 2018). Non-lethal heroin overdose has been associated with a number of health-related consequences, including brain injury caused by hypoxia or anoxia secondary to respiratory distress or arrest (Grigorakos, et al., 2010). Acquired brain injury (ABI) secondary to prescription opioid use/misuse may not be fully understood.

## **The Opioid Epidemic in the United States**

Over the past two decades, opioid use in the United States has escalated dramatically. This increase in opioid use involves not only legal prescriptions issued for medical purposes, but also drug diversions, misuse, and abuse. In a 2010 survey on drug use and health, 5.1 million persons age 12 and older reported using prescription pain relievers in the prior month for non-medical use (Substance Abuse and Mental Health Services Administration, 2011). In fact, between 1998 and 2010, non-medical use of psychotherapeutics (i.e., pain relievers, tranquilizers, stimulants

and sedatives) increased a staggering 178%. Prescriptions for all narcotic analgesics were in excess of 238 million in 2011. Hydrocodone (Vicodin) was the most frequently prescribed, with 136.7 million prescriptions written. Laxmaiah and colleagues (2012) attribute this opioid epidemic to at least four sources: 1) relaxing of laws governing state medical boards in prescribing opioids for treating chronic pain; 2) the introduction of new pain management standards by the Joint Commission on the Accreditation of Healthcare Organizations (JCAHO); 3) the “right to pain relief” movement; and 4) aggressive pharmaceutical marketing.

### **The Relationship between Acquired Brain Injury and Substance Use/Misuse**

Corrigan (1995) observed that substance misuse after brain injury detracts from the outcomes patients may attain and sustain, thus reducing the cost effectiveness of rehabilitation interventions. Substance misuse is more typically the cause of brain injury than a result (Bjork and Grant, 2009); however, recent studies have suggested that early childhood injuries may predispose individuals to adult misuse (McKinlay et al., 2014; Weil et al., 2016). While most of this work has been based on alcohol misuse, similar relationships can be expected for illicit drug use, including opioids.

Though not classified as depressants, opioids can produce depressant actions nonetheless. The primary depressant action of opioids is on the respiratory and gastrointestinal systems. Depressing the respiratory system to the point of respiratory distress or arrest can result in hypoxic and/or anoxic brain injury (encephalopathy). Additionally, chronic use of opioids, such as in methadone maintenance, has been shown to result in cognitive impairment as compared to controls without substance use histories (Mintzer and Stitzer, 2002; Shane et al., 2000).

An anoxic injury occurs when the brain is completely deprived of oxygen, and cell death begins after only 5-6 minutes of oxygen deprivation. Hypoxic brain injuries occur from insufficient oxygen supply to the brain. Overdoses severe enough to cause brain damage due to depriving the brain of oxygen will generally cause a hypoxic, not anoxic, brain injury. Cognitive consequences of hypoxic brain injury can include slowed reaction time, impulsivity in decision making, and impaired working memory, visual motor skills, and executive functions. Impairments in multiple cognitive domains can negatively impact everyday functioning and increase the likelihood of poorer social and vocational outcome. (Dassanyake, et al., 2012).

Professionals also recognize that individuals living with brain injury are at increased risk for addiction or relapse post brain injury. Cognitive issues, depression, decreased socialization coupled with potential lifestyle and familial relationships make these individuals more vulnerable for addiction. Additional considerations for persons with brain injury include chronic pain, headaches, heterotopic ossification, depression, anxiety, PTSD, social isolation, and limited vocational and recreational opportunities (Corrigan, et al., 2013). Since brain injury reduces the individual’s cerebral reserve, the threshold at which hypoxia may result in neurological harm is potentially lowered and further highlights the enhanced vulnerability of this population. Given this, individuals with brain injury may be prescribed opioids and may be at risk for negative consequences associated with their use, although this relationship has not been established.

## **Treatment Issues**

A number of treatment models for addressing substance use/misuse among individuals with brain injury have been proposed; however, few models or specific interventions have been empirically validated. Best practices for treatment of substance use/misuse in the population include: abstinence; patient and family education; incentives to encourage participation and retention in programs; modifying AA/NA to make it more concrete and understandable, and encouraging those attending AA/NA to stay with one group; use of motivational interviewing techniques; interventions that support adaptive coping; use of community resources to maximize social interaction and minimize boredom; and matching materials and interventions with cognitive deficits stemming from injury (Zgaljardic et al., 2015). Treatment for substance misuse should be integrated into the treatment process as seamlessly as any other form of therapy and counseling. It is recommended that information be presented in smaller chunks with repetition. Other common rehabilitation strategies are also applicable, including smaller groups, journaling, role-play, and allowing for delayed processing time.

## **Barriers and Treatment Recommendations**

Numerous barriers exist for treating acquired brain injury and co-occurring substance use/misuse. These barriers include (but are not limited to):

- Limited or no access to post-hospital (post-acute) rehabilitation (of any kind) due to lack of funding.
- Clinicians working in substance abuse treatment programs may feel ill equipped to address the neurological consequences of brain injury when providing treatment, and likewise, many brain injury treatment programs may not have qualified staff or the expertise to treat patients with brain injury and co-occurring substance use/misuse.
- Lack of surveillance regarding acquired brain injury caused by non-lethal opioid overdose.

## **Next Steps**

- Increase awareness of non-lethal opioid overdose and acquired brain injury. There is much discussion regarding prescription and non-prescription opioid abuse and deaths due to opioid overdose but little discussion regarding anoxic/hypoxic brain injuries resulting from non-lethal opioid overdose.
- Encourage physicians to document brain injury (i.e., anoxic encephalopathy) as a diagnosis, as appropriate, when treating persons following non-lethal opioid overdose. Often, morbidity associated with non-fatal overdose is reported using diagnoses such as peripheral neuropathy, temporary paralysis of limbs, severe sepsis, acute respiratory distress syndrome, seizures, alcohol dependence, and various psychiatric illnesses.
- Conduct an epidemiologic study to determine incidence of acquired brain injury from non-fatal opioid overdose, as well as opioid abuse that develops after any type of brain injury.

- Encourage brain injury rehabilitation programs to address patients in brain injury rehabilitation who have co-occurring histories of substance misuse/dependence (see Brain Injury User's Guide – Ohio Valley Center for Brain Injury Prevention and Rehabilitation).
- Increase awareness among behavioral health providers of the need to recognize persons with histories of brain injury who require accommodations in treatment for the neurological effects of their brain damage.

## REFERENCES

- Bogner, JA, Corrigan, JD, Spafford, DE, Lamb-Hart, G. Integrating substance abuse treatment and vocational rehabilitation after traumatic brain injury. *Journal of Head Trauma Rehabilitation*. 12: 57-71, 1997
- Bogner J, Corrigan JD. Interventions for substance misuse following TBI: A systematic review. *Brain Impairment* doi: 10.1017/brimp.2013.5
- Bjork JM and Grant SJ. Does traumatic brain injury increase risk for substance abuse? *Journal of Neurotrauma*. 26: 1077-1082, 2009.
- Corrigan JD. Substance abuse as a mediating factor in outcome from traumatic brain injury. *Archives of Physical Rehabilitation*. 76: 302-309, 2015.
- Dassanayake TL, Michie PT, Jones A, et al. Cognitive impairment in patients clinically recovered from central nervous system depressant drug overdose. *Journal of Clinical Pharmacology*. 32: 503-510, 2012
- Graham DP, and Cardon AI. An update on substance use and treatment following traumatic brain injury. *Annals of the New York Academy of Sciences*. 1141: 148-162, 2008
- Grigorakos L, Sakagianni K, Tsigou E, et al. Outcome of acute heroin overdose requiring intensive care unit admission. *Journal of Opioid Management*. 6: 227-231, 2010.
- Institute of Medicine (IOM). *Relieving Pain in America: A Blueprint for Transforming Prevention, Care, Education, and Research*. The National Academies Press, Washington, DC, June 29, 2011.
- Laxmaiah M, Helm S, Fellows B, et al. Opioid epidemic in the United States. *Pain Physician*. 15: 9-38, 2012.
- McKinlay A, Corrigan J, Horwood LJ, et al. Substance abuse and criminal activities following traumatic brain injury in childhood, adolescence, and early adulthood. *Journal of Head Trauma Rehabilitation*, 29: 498-506, 2014.
- Mintzer M and Stitzer M. Cognitive impairment in methadone maintenance patients. *Drug and Alcohol Dependence*. 67: 41-51, 2002.
- National Institute on Drug Abuse (NIDA). Opioids. Retrieved from <https://www.drugabuse.gov/drugs-abuse/opioids> on 2018, January 31.
- Shane D, Sims J, McDonald S, et al. Cognitive impairment among methadone maintenance patients. *Addiction*. 95: 687-695, 2000.
- Weil Z, Karlina K, Gaier KR, Corigan TED, et al. Juvenile traumatic brain injury increases alcohol consumption and reward in female mice. *Journal of Neurotrauma*, 33: 895-903, 2016.
- Zgaljardic DJ, Seale GS, Schaefer LA, et al. Psychiatric disease and post-acute traumatic brain injury. *Journal of Neurotrauma*. 32: 1-15, 2015).

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