



Chest compressions and rescue breathing when administering naloxone in opioid overdose

? Questions

- What does the evidence say about the use of chest compressions and/or the use of rescue breathing when responding to an opioid overdose and administering naloxone?

🔑 Key Take-Home Messages

- Opioid overdoses cause respiratory failure (a reduction or stop in breathing), which can lead to cardiac arrest (1, 2).
- In the event of a suspected opioid overdose, bystanders should call 911 and administer naloxone before any attempts at resuscitation (3-5).
- Various expert groups have differing opinions on the appropriateness of using chest compressions only, rescue breathing only or chest compressions combined with rescue breathing when trying to resuscitate someone experiencing an opioid overdose.
- In general, chest compressions are recommended for someone experiencing a sudden cardiac arrest while rescue breathing is critical for people experiencing respiratory failure (6). However, it can be difficult for bystanders to distinguish between the signs of respiratory failure and cardiac arrest and know how to respond (3).
- Three factors should be taken into consideration when determining how best to respond: bystander skill-level (i.e. ability to recognize signs of opioid overdose and perform CPR), certainty of cardiac (heart) or pulmonary (lung) function and type and amount of opioids involved.
- There is not enough data to strongly recommend prioritizing chest compressions and/or rescue breathing (6).

References

1. World Health Organization, United Nations Office on Drugs and Crime. Opioid overdose: Preventing and reducing opioid overdose mortality. <https://www.unodc.org/docs/treatment/overdose.pdf>. 2013.
2. US Department of Health and Human Services, Substance Abuse and Mental Health Services Administration. Opioid Overdose Toolkit: Five Essential Steps for First Responders. http://www.integration.samhsa.gov/opioid_toolkit_firstresponders.pdf. 2013.
3. Leece PN, Hopkins S, Marshall C, Orkin A, Gassanov MA, Shahin RM. Development and implementation of an opioid overdose prevention and response program in Toronto, Ontario. *Can J Public Health*. 2013;104(3):e200-4.
4. World Health Organization. Community Management of Opioid Overdose. http://apps.who.int/iris/bitstream/10665/137462/1/9789241548816_eng.pdf. 2014.



What We Found

In recent years, individuals in community settings have been trained to administer naloxone in response to opioid overdoses. As of June 2016, pharmacists in Ontario are able to provide naloxone without a prescription to individuals willing to participate in naloxone administration training (7). These services are provided at no cost (7).

Formal literature searches found three approaches to responding to opioid overdoses, in combination with administering naloxone:

- chest compressions only
- rescue breathing only
- chest compressions and rescue breathing together (CPR).

There is little consensus on the appropriateness of each approach. A 2016 report found that there is not enough data to strongly recommend prioritizing chest compressions and/or rescue breathing – and, in fact, both could cause harm if used or delivered inappropriately (6).

Chest compressions

The American Heart Association recommends hands-only resuscitation (i.e. chest compressions) for those untrained in CPR as a response to sudden cardiac arrest (6, 8). This recommendation is based on the following premises:

- in sudden cardiac arrest the blood is fully oxygenated, so circulation will provide oxygen to the vital organs
- interrupting chest compressions to do rescue breathing may decrease efficacy
- rescue breathing is distasteful to many bystanders and often done improperly; it may, in fact, be a deterrent to efforts at first aid
- chest compressions may be easier to teach, particularly for emergency dispatchers who are directing responders over the phone (6).

Some studies have shown that chest compressions are as effective or more effective in sudden cardiac arrest as chest compressions combined with rescue breathing; however, it is important to note that these studies' samples did not include participants experiencing opioid overdoses (9-11).

5. Harm Reduction Coalition. Mouth-to-mouth resuscitation is essential in responding to opioid overdoses. <http://harmreduction.org/wp-content/uploads/2012/02/alert-hands-only-cpr.pdf>. 2012.

6. New York State, Department of Health, AIDS Institute. Technical Working Group on Resuscitation Training in Naloxone Provision Programs. https://www.health.ny.gov/diseases/aids/general/opioid_overdose_prevention/docs/resuscitation_training.pdf. 2016.

7. Ontario Ministry of Health and Long-term Care. Ontario's Naloxone Pharmacy Program. <http://www.health.gov.on.ca/en/public/programs/drugs/naloxone.aspx>. Government of Ontario, 2016.

8. American Heart Association. Guidelines for CPR & ECC <http://eccguidelines.heart.org/wp-content/uploads/2015/10/2015-AHA-Guidelines-Highlights-English.pdf>. 2015.

9. Rea TD, Fahrenbruch C, Culley L, Donohoe RT, Hambly C, Innes J, et al. CPR with chest compression alone or with rescue breathing. *N Engl J Med*. 2010;363(5):423-33. doi: 10.1056/NEJMoa0908993.

10. Svensson L, Bohm K, Castren M, Pettersson H, Engerstrom L, Herlitz J, et al. Compression-only CPR or standard CPR in out-of-hospital cardiac arrest. *N Engl J Med*. 2010;363(5):434-42. doi: 10.1056/NEJMoa0908991.

11. Iwami T, Kitamura T, Kawamura T, Mitamura H, Nagao K, Takayama M, et al. Chest compression-only cardiopulmonary resuscitation for out-of-hospital cardiac arrest with public-access defibrillation: A nationwide cohort study. *Circulation*. 2012;126(24):2844-51. doi: 10.1161/CIRCULATIONAHA.112.109504.

Few studies have examined the use of chest compressions in cases of respiratory failure, which often occurs in the case of opioid overdose. Moreover, little data exists on how much air is moved by chest compressions alone and no research exists on the effects of chest compressions in an individual who is already hypoxic and experiencing an opioid overdose (6).

One Canadian intervention, piloted by Toronto Public Health, described the development of a comprehensive community-based opioid overdose prevention and response program with naloxone distribution (3). In the first eight months of the program, 209 individuals were trained and 17 reported administering naloxone with no fatalities. The authors of this paper acknowledge that the program's resuscitation protocol has come under scrutiny for its focus on chest compressions only. Nonetheless, the program justified its protocol based on the assertions that:

- first responders are unable to identify unresponsive pulseless patients reliably
- naloxone administration has no role in cardiac arrest (including those due to opioid overdose)
- ventilation may be complicated by bystander resuscitation
- significant numbers of opioid-related deaths are a result of polysubstance overdose with cardiotoxic drugs (3).

Rescue breathing

Opioids depress respiratory function and breathing. As a result, during an opioid overdose, the person may experience reduced breathing or cease breathing (1, 2). A number of reports and toolkits recommend rescue breathing as the best method to restore breathing and prevent an overdose death (2, 12-15).

Chest compressions may be better than taking no course of action during an opioid overdose; however, the Harm Reduction Coalition notes that rescue breathing provides oxygen and is essential in opioid overdoses, where breathing slows gradually and the reserve of oxygen in the blood is less than in cases of sudden cardiac arrest (5). The Harm Reduction Coalition recommends that overdose prevention education emphasize the role of rescue breathing, with or without chest compressions, in the case of a suspected opioid overdose (5).

A paper prepared by the WHO and UN Office on Drugs and Crime suggests that the focus should be on addressing respiration and oxygenation, either by rescue breathing, bag and mask or pressure-controlled ventilation (1). Similarly, a New York State-based working group suggests that rescue breathing directly responds to oxygen deficiency and is vital in cases when responders do not call

12. Curtis M, Guterman L. Overdose Prevention and Response: A guide for People Who Use Drugs and Harm Reduction Staff in Eastern Europe and Central Asia. https://www.opensocietyfoundations.org/sites/default/files/overdose_20090604.pdf. Open Society Institute, 2009.

13. University of Washington, Alcohol & Drug Abuse Institute. Opioid Overdose Education Brochure. http://www.stopoverdose.org/docs/Naloxone_PRO_brochure.pdf. 2013.

14. Massachusetts Department of Public Health. Opioid Overdose Education and Naloxone Distribution: MDPH Naloxone Pilot Project Core Competencies. <http://www.mass.gov/eohhs/docs/dph/substance-abuse/core-competencies-for-naloxone-pilot-participants.pdf>. 2012.

15. Prevention Point Pittsburgh. If someone overdosed would you know what to do? http://www.achd.net/bio-stats/pubs/pdf/01_PPPGH_bro_FINAL.pdf. 2016.

16. Asian Harm Reduction Network. Overdose Prevention and Management among Opiate Users. http://www.naloxoneinfo.org/sites/default/files/AHRN_PSI_Overdose_Prevention_Report_Final_2013.pdf. 2013.

17. American Society of Anesthesiologists. Opioid Overdose Resuscitation. <https://www.asahq.org/WhenSecondsCount/resources>. 2013.

18. National Treatment Agency, UK Department of Health. The Harm Reduction Works: Overdose: Everything You Need to Know. <http://www.harmreductionworks.org.uk/resources/pdf/HRD-VD6N.pdf>. National Treatment Agency, Department of Health: 2009.

emergency medical services promptly – especially if naloxone is not available (6). However, if poorly executed, rescue breathing may increase the risk of asphyxiation.

Combining the two – rescue breathing and chest compressions

Progressive respiratory failure and metabolic disturbances in opioid overdoses may lead to cardiac arrest (4, 6). Although chest compressions only are the suggested response to a non-opioid-induced cardiac arrest, a 2014 guideline prepared by the WHO Department of Mental Health and Substance Abuse in collaboration with the WHO HIV Department suggests there is a clear benefit in providing rescue breathing in combination with chest compressions in suspected opioid overdoses as well as potential harm in not providing rescue breathing (4). A number of reports and toolkits for opioid overdose prevention suggest that rescue breathing should be the first step in resuscitation but, if the heart stops beating, chest compressions are needed to pump oxygenated blood to key organs (16-19).

Some trials provide indirect evidence of the benefits of CPR in opioid overdose. A Melbourne study (20), which examined the benefits of bystander-administered CPR in non-fatal heroin overdoses compared to no CPR, found that CPR was associated with statistically significant improvements in clinical outcomes, although it is relatively uncommon. These results suggest that CPR training may be effective in minimizing the harms associated with overdoses. Another study (21) that examined the feasibility of training people who inject drugs to perform CPR and administer naloxone found that naloxone was administered in 75% of events and CPR was performed in 80% of events; hence, people who inject drugs can be trained to respond to heroin overdose by using CPR and naloxone.

Determining the appropriate course of action

In response to an opioid overdose, there is general agreement that the first steps are to call local emergency medical services and then administer naloxone. However, there is little consensus on the subsequent steps, and the appropriateness of chest compressions only, rescue breathing only or chest compressions combined with rescue breathing. A 2016 report found that there is not enough data to strongly recommend prioritizing chest compressions and/or rescue breathing (6). In fact, both could cause harm if used or delivered inappropriately (6).

According to the literature, three factors should inform decision-making about what to do during a drug overdose:

1. Bystander skill-level (i.e. ability to recognize signs of opioid overdose and ability to perform CPR)

19. NYC Department of Health and Mental Hygiene. Overdose Prevention: Train-the-Trainer for NYPD. <http://slideplayer.com/slide/5808764/>. 2013.

20. Dietze P, Cantwell K, Burgess S. Bystander resuscitation attempts at heroin overdose: does it improve outcomes? *Drug Alcohol Depend.* 2002;67(2):213-8.

21. Seal KH, Thawley R, Gee L, Bamberger J, Kral AH, Ciccarone D, et al. Naloxone distribution and cardiopulmonary resuscitation training for injection drug users to prevent heroin overdose death: a pilot intervention study. *J Urban Health.* 2005;82(2):303-11.

2. Certainty of cardiac or pulmonary function.
3. Type and amount of opioids involved

Bystander skill-level

A responder’s ability to recognize signs of opioid overdose and ability to perform CPR are crucial. If the responder is trained in CPR and is certain that the person is experiencing an opioid overdose, he or she will be able to differentiate between cardiac arrest and pulmonary failure and, therefore, should be able to safely perform the appropriate measures in response to the overdose. However, in community settings, it is possible that those encountering people experiencing opioid overdoses may not be trained in CPR or able to distinguish between pulmonary failure and cardiac arrest. In such instances, there is disagreement on whether the appropriate response is rescue breathing and/or chest compressions, and on their subsequent consequences.

Certainty of cardiac or pulmonary function

In opioid overdoses, breathing gradually slows which, in some cases, leads to cardiac arrest. To ensure the right course of action is taken, the responder must be able to distinguish between cardiac arrest and pulmonary failure. If the responder is not able to distinguish between these two states, the response – whether chest compressions and/or rescue breathing – could result in severe and negative consequences (i.e. increased risk of asphyxiation, chest trauma, rib fracture) (6).

Type and amount of opioids involved

Knowing the type and amount of substances involved in an overdose can help determine the appropriate course of action because varying amounts and types of substances may elicit specific physiological reactions. However, responders may not always be aware of type and amount of substances the person has taken.

The attached schematic – developed based on the differing recommendations by multiple stakeholders – illustrates the different courses of

action that can be taken in response to an opioid overdose depending on the knowledge and skills of the person responding and the symptoms of the person experiencing the overdose.

It highlights the conflicting perspectives on the most appropriate course of action. As the schematic shows, the decision to conduct either chest compressions, rescue breathing or both must be based on observed vital signs as well as the skills, comfort level and experience of the responder.

 **What We Did**

We searched the peer-reviewed literature using Medline with a combination of relevant search terms on opioid overdose, naloxone administration, CPR, chest compressions and rescue breathing. Searches yielded 242 references from which 7 studies were included. Additional grey literature searches were conducted using Google and similar search terms, yielding 14 reports and toolkits for overdose prevention. All searches were conducted on June 8, 2016 and results were limited to English articles.

Rapid Response: Evidence into Action

The OHTN Rapid Response Service offers quick access to research evidence to help inform decision making, service delivery and advocacy. In response to a question from the field, the Rapid Response Team reviews the scientific and grey literature, consults with experts, and prepares a brief fact sheet summarizing the current evidence and its implications for policy and practice.

Suggested Citation

Rapid Response Service. Chest compressions and rescue breathing when administering naloxone in opioid overdose. Toronto, ON: Ontario HIV Treatment Network; August 2016.

Prepared by

Sanjana Mitra
 Laura Schoffel
 Jason Globerman

Program Leads / Editors

Jason Globerman
 Jean Bacon
 Sean B. Rourke

Contact

rapidresponse@ohtn.on.ca

For more information visit

www.ohtn.on.ca/rapid-response-service



The Ontario HIV Treatment Network
 1300 Yonge Street, Suite 600
 Toronto ON M4T 1X3
 www.ohtn.on.ca

