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**CDC HEALTH ADVISORY**

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**Hurricane Harvey—Clinical Guidance for Carbon Monoxide (CO)  
Poisoning**

**Summary**

Carbon monoxide (CO) is an odorless, colorless, poisonous gas that can cause sudden illness and death if present in sufficient concentration in the ambient air. During a significant power outage, persons using alternative fuel or power sources such as generators or gasoline powered engine tools such as pressure washers might be exposed to toxic CO levels if the fuel or power sources are placed inside or too close to the exterior of the building causing CO to build up in the structure. The purpose of this HAN advisory is to remind clinicians evaluating persons affected by the storm to maintain a high index of suspicion for CO poisoning. Clinicians are advised to consider CO exposure and take steps to discontinue exposure to CO. Clinicians are also advised to ask a patient with CO poisoning about other people who may be exposed to the same CO exposure, such as persons living with or visiting them so they may be treated for possible CO poisoning.

**Background**

Hurricane Harvey made landfall between Port Arkansas and Port O'Connor, Texas on August 25, 2017, causing 300,000 persons to lose power. When power outages occur during emergencies such as hurricanes or winter storms, the use of alternative sources of fuel or electricity for heating, cooling, or cooking can cause CO to build up in a home, garage, or camper and poison the people and animals inside. Although CO poisoning can be fatal to anyone, children, pregnant women, and older adults as well as persons with chronic illness are particularly vulnerable to CO poisoning. The symptoms and signs of CO poisoning are variable and nonspecific. The most common symptoms of CO poisoning are headache, dizziness, weakness, nausea, vomiting, chest pain, and altered mental status. Symptoms of severe CO poisoning include malaise, shortness of breath, headache, nausea, chest pain, irritability, ataxia, altered mental status, other neurologic symptoms, loss of consciousness, coma, and death. Signs and clinical manifestations of severe CO poisoning include tachycardia, tachypnea, hypotension, various neurologic findings including impaired memory, cognitive and sensory disturbances, metabolic acidosis, arrhythmias, myocardial ischemia or infarction, and noncardiogenic pulmonary edema, although any organ system might be involved.

An elevated carboxyhemoglobin (COHgb) level of 2% or higher for non-smokers and 9% or higher COHgb level for smokers strongly supports a diagnosis of CO poisoning. The COHgb level must be interpreted in light of the patient's exposure history and length of time away from CO exposure, as levels gradually fall once the patient is removed from the exposure.

With a focused history, exposure to a CO source may become apparent; items in the history that might trigger a higher index of suspicion for CO poisoning in this setting include lack of a fever, recurrent symptoms, and multiple family members affected by similar symptoms. Appropriate and prompt diagnostic testing and treatment are crucial to reduce morbidity and prevent mortality from CO poisoning.

**Recommendations**

CDC recommends that clinicians:

- 1) Consider CO poisoning in persons affected by Hurricane Harvey, particularly persons who are currently without power. All people affected by the storm should be advised about safe practices related to generators, grills, camp stoves, or other gasoline, propane, natural gas, or charcoal-burning devices, including that these devices should never be used inside a home, basement, garage, or camper — or even outside near an open window or window air conditioner. Please see <https://www.cdc.gov/co/pdfs/generators.pdf>.
- 2) Ask patients presenting for treatment who are affected by Harvey about symptoms consistent with CO poisoning. Clinicians should also ask about exposure to any fuel or power sources that place a person at increased risk for CO poisoning, including gas-powered generators, charcoal grills, propane stoves, charcoal briquettes, and other indoor heating and cooking devices. Evaluation should also include examination for other conditions, including smoke inhalation, trauma, medical illness, or intoxication.
- 3) Administer 100% oxygen to persons in whom a diagnosis of CO poisoning is known or suspected until the patient is symptom-free or until a diagnosis of CO poisoning has been ruled out. Duration of oxygen treatment in persons with CO poisoning is usually about 4–5 hours.
- 4) Perform COHgb testing when the diagnosis of CO poisoning is being considered. The most common technology available in hospital laboratories for analyzing the blood is the multiple wavelength spectrophotometer, also known as a CO-oximeter. Venous or arterial blood may be used for testing. A fingertip pulse CO-oximeter can be used to measure heart rate, oxygen saturation, and COHgb levels in the field, but suspicion of CO poisoning should be confirmed with a COHgb level by CO-oximeter. A conventional two-wavelength pulse oximeter is not accurate when COHgb is present. For more information, see [https://www.cdc.gov/disasters/co\\_guidance.html](https://www.cdc.gov/disasters/co_guidance.html).
- 5) An elevated carboxyhemoglobin (COHgb) level of 2% or higher for non-smokers and 9% or higher COHgb level for smokers strongly supports a diagnosis of CO poisoning. The COHgb level must be interpreted in light of the patient's exposure history and length of time away from CO exposure, as levels gradually fall once the patient is removed from the exposure. In addition, carbon monoxide can be produced endogenously as a byproduct of heme metabolism. Patients with sickle cell disease can have an elevated COHgb level as a result of hemolytic anemia or hemolysis. For additional information about interpretation of COHgb levels, visit [https://www.cdc.gov/disasters/co\\_guidance.html](https://www.cdc.gov/disasters/co_guidance.html) or call Poison Control at (800) 222-1222.
- 6) Hyperbaric oxygen therapy (HBO) should be considered when the patient has a COHgb level of more than 25–30%, there is evidence of cardiac involvement, severe acidosis, transient or prolonged unconsciousness, neurological impairment, abnormal neuropsychiatric testing, or the patient is  $\geq 36$  years in age. HBO is also administered at lower COHgb (<25%) levels if suggested by clinical condition and/history of exposure. For pregnant women, hyperbaric oxygen is the treatment of choice, even if they are less severely poisoned. Hyperbaric oxygen is safe to administer and international consensus favors it as part of a more aggressive role in treating pregnant women. For additional management considerations, consult a toxicologist, Poison Control at (800) 222-1222, or a hyperbaric oxygen facility.
- 7) Be aware that CO exposure may be still occurring in other people residing with or visiting CO poisoned patients. Clinicians treating people for CO poisoning should ask whether other persons living with or visiting the poisoned individual are currently being exposed to CO and notify emergency medical services (EMS), the fire department, or law enforcement as applicable in their area. The CO exposure should be eliminated, and other persons who might be poisoned should be evaluated and tested as described in this advisory.

#### **For More Information**

[https://www.cdc.gov/disasters/co\\_guidance.html](https://www.cdc.gov/disasters/co_guidance.html)

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